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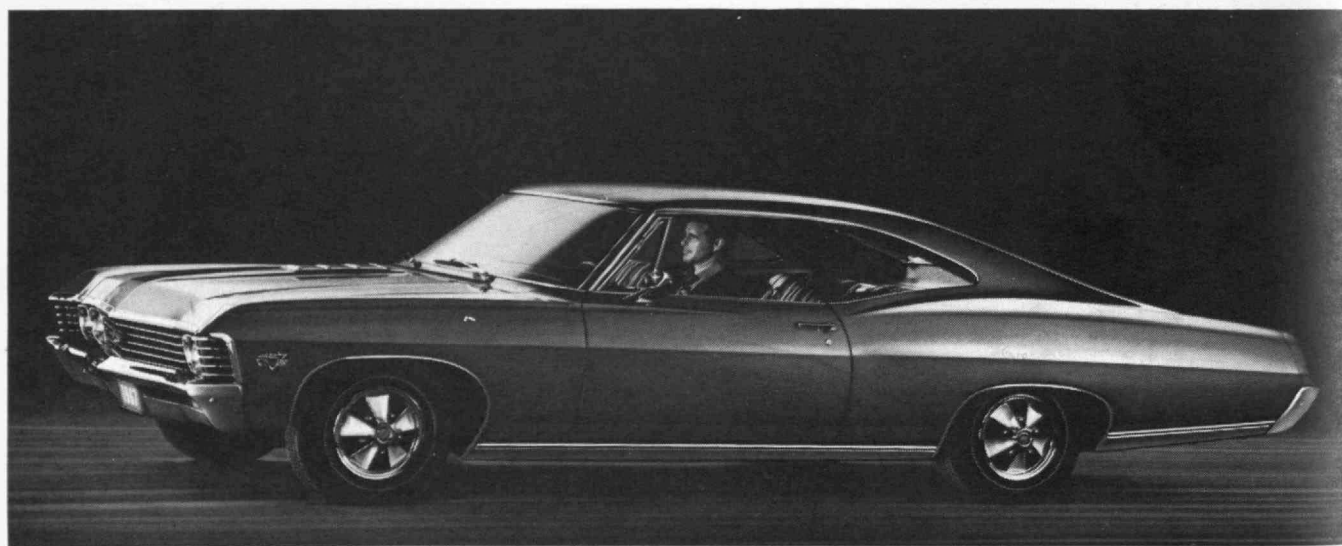
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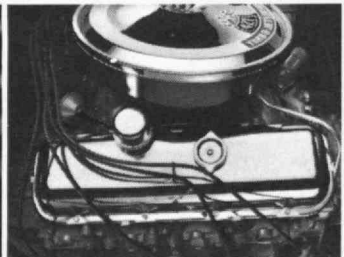
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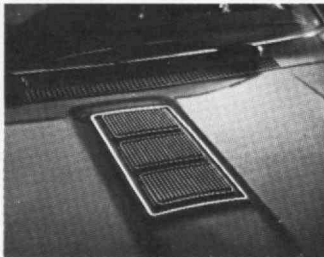
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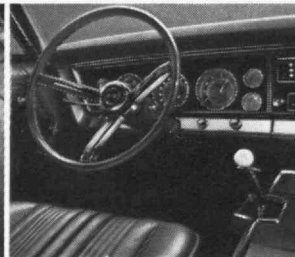
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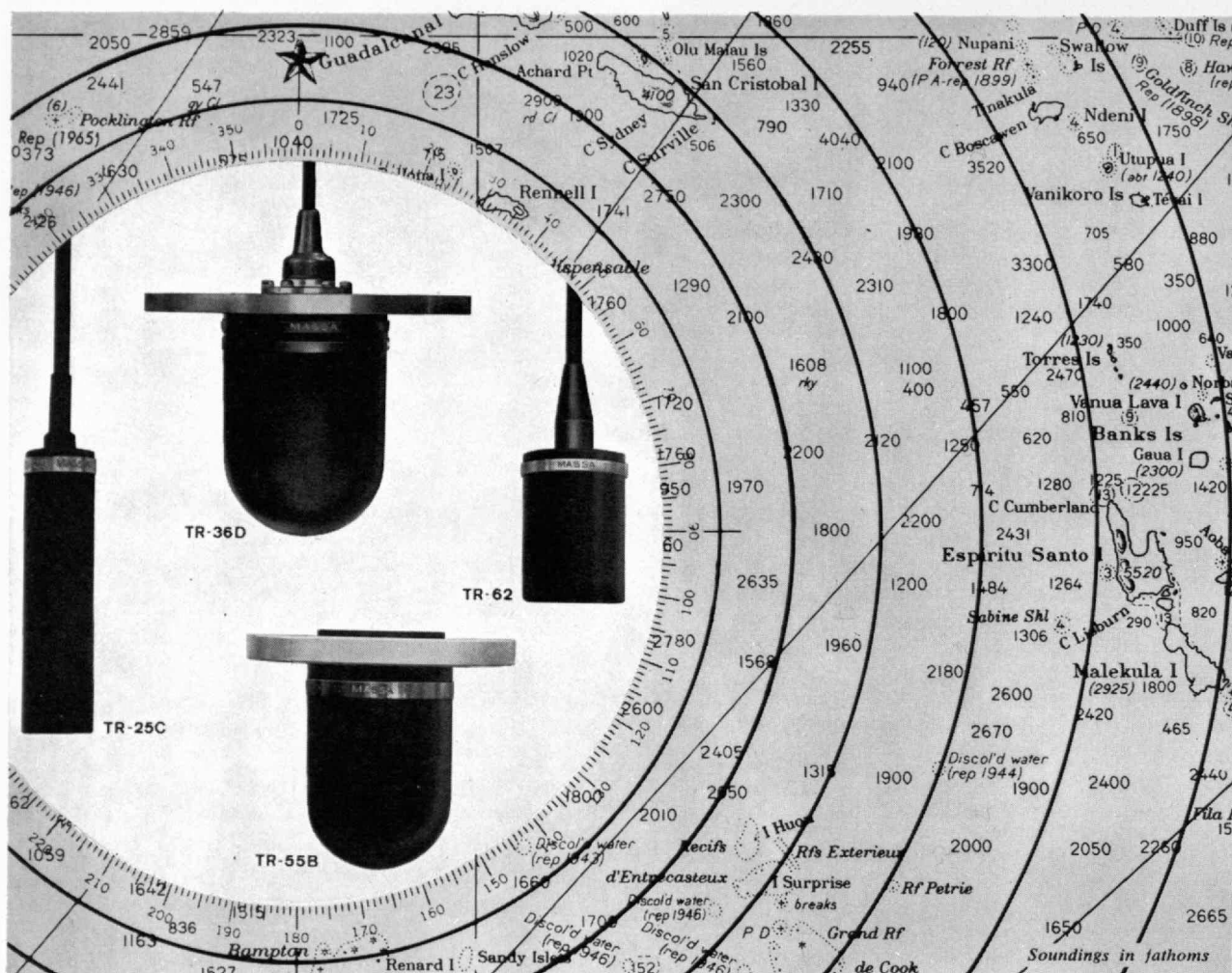
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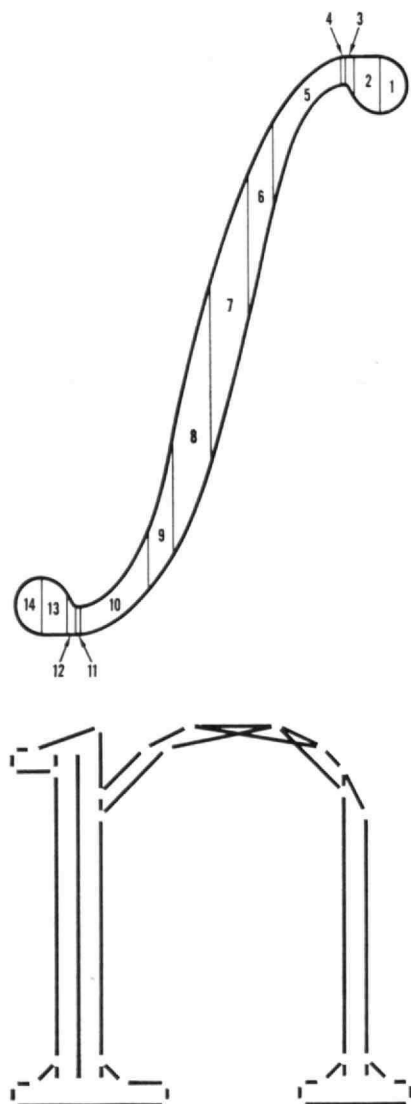
Report from

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ELECTRONIC GRAPHICS BY COMPUTER

Computer information is most useful when it is displayed in an easily usable form. For this reason, much effort is currently being directed toward finding better visual outputs from computers — graphs and “pictures” instead of numbers. And an important aspect of this problem is improving the graphic quality of the images.

At Bell Telephone Laboratories, researchers M. V. Mathews and H. S. McDonald have devised an efficient and versatile method of “drawing” any conceivable shape or graphical design on the screen of a cathode-ray tube. For example, entire pages of text matter can be drawn on the screen in any desired type font, and then photographed. As a demonstration, the above headline, these words, and the sample mathematics and music below were produced by this experimental method.



Two programming methods used to generate graphical material: An integral sign (top) is formed by the “patch” method, whereby the image is divided into a number of constituent areas or patches (fourteen patches in this case). After the areas are specified, the electron beam fills each one in. In another method, used here to form the letter “n”, the electron beam follows the paths of the vector lines shown. Beam is wide enough to fill in areas between vectors.



$$\int_0^{\infty} \sqrt{x} e^{-ax} dx$$

At present, information describing the shapes of each of about 450 letters and symbols is stored numerically in a computer. No masks, negatives or other physical forms of the graphics are used. An operator tells the computer what text and/or other matter is to be produced. The computer calls upon its memory and directs the motions of the electron beam in the cathode-ray tube needed to trace out the images.

Preparing material with this technique offers the advantages of current mechanical methods plus the opportunity to correct while writing, change letter style and symbol forms, arrange lines with an even right-hand margin (justification), and vary type size — all with a heretofore unattainable ease and speed.



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The Prosperity Gap

By Robert C. Cowen, '49

PASADENA—It may be that mankind is facing a challenge more awesome than any the race has yet encountered.

It is posed by the prosperity gap. This is the economic divergence between industrial countries with rising living standards and underdeveloped nations burdened with too many people and deepening poverty. Harrison Brown of the California Institute of Technology thinks this trend has placed humanity "at the most critical period of its history."

He explains it this way: "Our basic problem, really, is not that of supporting comfortably the distressingly large numbers of people who we now know will inevitably inhabit the earth in the decades ahead. I am convinced that technically this can be done.

"Our basic problem is that of getting from here to there successfully with a minimum of chaos and human suffering. We are called upon to make the most difficult transition the community of man has yet been called upon to make—that of bringing birth rates in balance with rapidly lowering death rates on a world-wide scale. At the same time, we are called upon to rapidly improve the economic well-being of the world's people."

Caltech anthropologist Dr. Thayer Scudder has reinforced this assessment with a rather drastic prediction. If the transition is not made, he foresees mankind diverging into essentially two species, the haves and the have-nots, each competing for the same ecological niche.

Perspicacity Misdirected

A decade ago, Professors Brown, James Bonner, and John Weir took a century-long look ahead in their book *The Next Hundred Years*. Many of their projected trends, such as energy use and mineral exploitation, have stood up well. But they fell down badly in the crucial matter of the prosperity gap.

The population boom took them completely by surprise. In the mid-1950's, the United Nations was projecting a world population of between 3.3 and 4.0 billion by 1980. Population hit the 3.3 billion mark in 1965. The Caltech wisemen had adopted the UN forecasts and had expected a population growth rate of about 2 per cent a year. It has turned out to be more like 3 per cent, with population growing twice as fast in underdeveloped lands

as elsewhere.

Then there is the economic disappointment. Dr. Bonner points out that they had thought yearly rises in food production of 2 per cent to be reasonable for the developing countries. With strong effort and the right kind of aid, they thought, rates as high as 4 per cent per annum might be achieved. But most of the food increase in those countries has come from bringing marginal land under the plow. The rise in yield per acre has been a disappointing 8 per cent in 10 years, or less than 1 per cent per annum. Furthermore, Dr. Scudder says there is evidence of land deterioration in many of the needy countries.

This is symptomatic of the generally weak economic growth of the developing nations. The Caltech experts feel that development planning in those lands is inadequate. Aid also has been relatively ineffective. They characterize it as piecemeal and often short term, an order of magnitude too small, and misdirected.

What they think is needed is at least a tenfold increase in the \$6 billion per year the industrial countries now are devoting to the purpose. This aid, they say, should be focused as a co-ordinated international effort for total economic development in the poor countries. Anything less, they feel, will fail to close the prosperity gap.

During a two-day discussion of this in March, the Caltech group sketched the challenge on a heroic scale. Dr. Brown foresaw a world population in 2000 A.D. of 7.5 billion. Some six billion would be living in what today are the underdeveloped countries. Bringing these people an adequate living standard will strain our planet's resources.

He explained that "if by some miracle all these persons were to be brought up to the level of living now enjoyed by the people of the United States, we would need to extract from the earth over 50 billion tons of iron, one billion tons of copper, an equal amount of lead, over 600 million tons of zinc, and nearly 100 million tons of tin in addition to huge quantities of other substances. These quantities are several hundred times the present world annual rates of production. Their extraction would virtually deplete the earth of all high-grade mineral resources and would necessitate our living off the leanest of earth substances: the waters of the sea and ordinary rock."

Given cheap atomic power, which now seems assured, the prospect of working such lean ores does not intimidate Dr. Brown and his colleagues.

He commented that "although depletion of the earth's buried high-grade resources should be a matter of serious concern to us all, it is by no means an

immediate threat nor is it an insurmountable problem. Given the necessary technology, which I am convinced can be developed, the earth has ample resources to enable persons the world over to lead abundant lives . . . In principle, we can feed, clothe, and support a population of, say, 10 billion persons at a reasonably high level of consumption for an indefinitely long period of time."

Dr. Brown would match this possibility with an equally massive development effort. He suggests the United States might boost its level of aid to something like \$30 billion a year over a 10-year period. Why not, he asks, "place the tactics and strategy of aid on as sound and continuing a basis as our defense organization?" He suggests a cabinet-level Department of Development with rank and resources comparable to those of the Department of Defense.

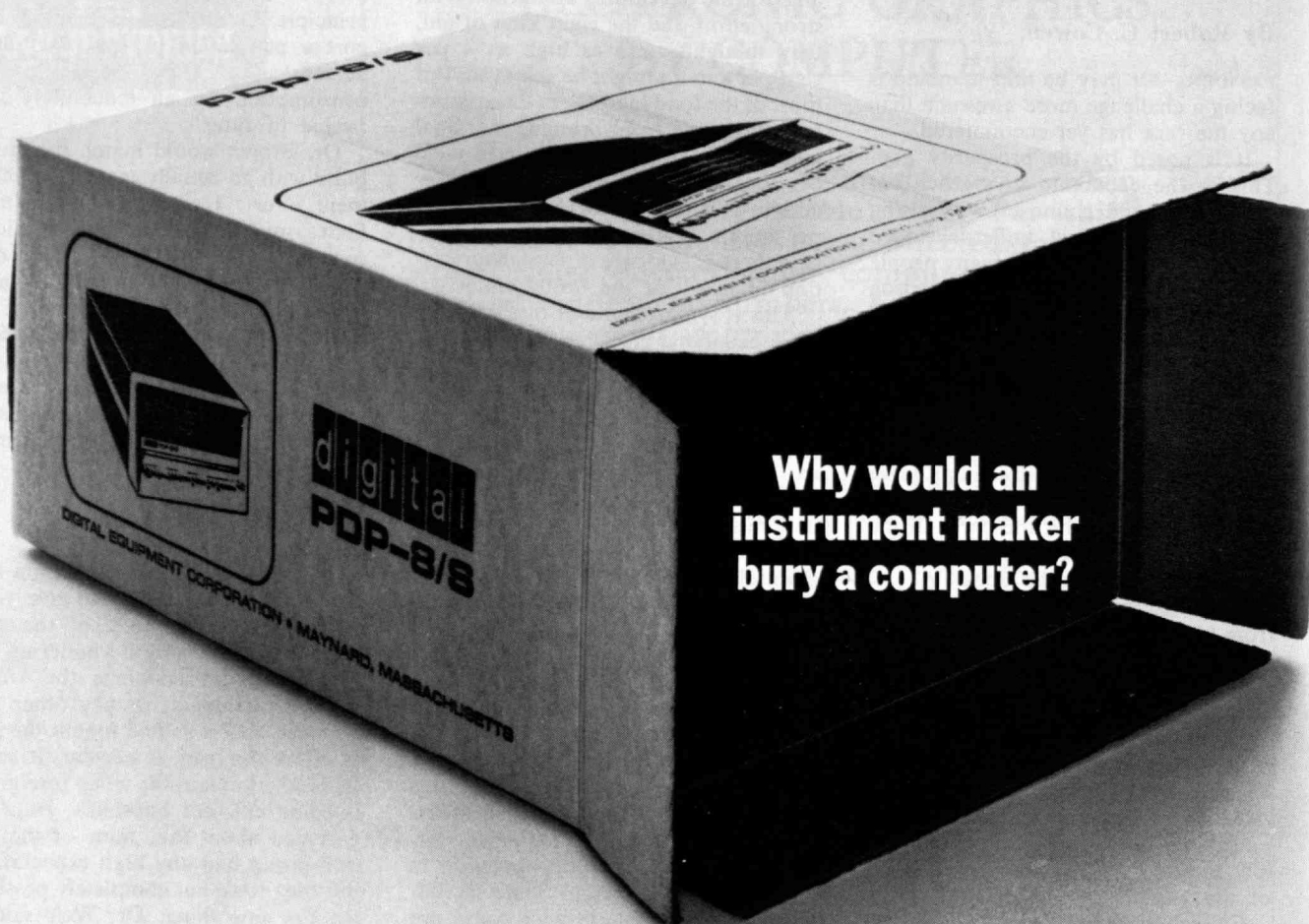
No Middle Ground

Listening to Dr. Brown and his colleagues spell all this out during a two-day conference does indeed give you a sense of the magnitude of the challenge. It also leaves you wondering how they expect to convince the United States government, or any other government, that it should mount the kind of effort they say is needed. It seems especially implausible when foreign aid is being cut, not boosted.

Asked about this, none of the Caltech group had any high expectations. But they were not completely pessimistic. For one thing, Dr. Weir said he thinks governments are much better informed about the problem than 10 years ago. Dr. Brown said he senses a growing desire in the United States Congress for a more effective aid program.

What's needed now, Dr. Brown said, is a kind of Rand Corporation for development. Just as the U.S. Air Force has a powerful aid to defense planning in the famed Rand think-tank, so aid planners need effective research support. Providing this may be feasible even with a taut Federal budget.

However, the Caltech group feels the United States and other industrial nations must be prepared to meet fully the challenge it has sketched. As Dr. Brown expressed it: "Our science and our technology have given us the power to create a world in which virtually all people can lead free and abundant lives. . . . Will future generations point to ours as that which made possible the realization of this higher level of human culture? Or will they point to ours as the generation which failed humanity at the most critical period of its history? I fear that there is no middle ground."



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Review on Books

Bell Ringers

By Joseph Mindel

During the Nineteenth Century, public lectures on science at the Royal Institution in London, the Jardin des Plantes in Paris, the Lowell Institute in Boston, Cooper Union in New York, and similar institutions in cities throughout Europe and America were remarkable not only in number but also in content and quality. Every field of science from astronomy to zoology was analyzed, explained, demonstrated. And those called—or moved—to give the lectures were, quite properly, the leading scientists of the times. "Let him who knows how," said Cervantes, "ring the bells."

Three books, each by a Nobel Laureate, illustrate the continuing tradition, with some variations possible only in the Twentieth Century.

Fundamental Genetic Mechanisms

John C. Kendrew, deputy chairman of the Medical Research Council Laboratory for Molecular Biology in Cambridge, England, delivered a series of 10 lectures on BBC Television in 1964 to an audience larger by many orders of magnitude than the largest of the pre-electronic era. *The Thread of Life* (Harvard University Press, Cambridge, Mass., 1966, 112 pp., \$4), which is based on the lectures, is subtitled "an introduction to molecular biology." The molecules of major interest are the two most complex and most important types, proteins and nucleic acids. Dr. Kendrew received the Nobel Prize for his share in determining the structure of proteins.

Without condescension or the sacrifice of accuracy, the book provides an exceptionally lucid account, on the level of the general reader, of the fundamental genetic mechanisms. Dr. Kendrew describes the experiments and reasoning leading to the conclusion that the nucleic acids are the "information carriers of living cells, the repositories of the blueprint which has to be passed on from generation to generation, from parental cell to progeny cell." The thread of life is the deoxyribonucleic acid (DNA) molecule which, with several kinds of ribonucleic acid (RNA), plays the key role.

In considering the functions of DNA in the cell, three questions must be asked. How does DNA replicate itself? How does DNA direct the synthesis of characteristic enzyme and protein molecules, thus passing on the hereditary information? What is the

code by means of which this information is stored along the DNA molecule? The answers, to the extent that they are presently known, are developed in elegant style, with the aid of more than 50 superb photographs placed together at the end of the book.

The complexity of research in molecular biology is indicated by the fact that the length of the DNA in the 46 human chromosomes is about three feet—all contained in a single cell a thousandth of an inch in diameter. As Dr. Kendrew points out, life is enormously complicated, and the current picture of the action of DNA is a considerable oversimplification. Nevertheless, even this degree of understanding encourages him to think of future fields of research in molecular biology. His own choices include the control of mutations, the phenomenon of mind, the problem of cancer, and the origin of life.

The Present and Future of Biology

Of Molecules and Men (University of Washington Press, Seattle, 1966, 99 pp., \$3.95) is based on the John Danz Lectures delivered in 1966 at the University of Washington by Francis Crick. Dr. Crick, a colleague of Dr. Kendrew in Cambridge, won his Nobel Prize for studies of the structure of DNA. The subject of the book, however, is not molecular biology nor DNA nor genetics. Instead he has "taken vitalism as a theme and . . . written down the sort of thing that I find my friends and colleagues are saying about our present and future knowledge of biology." It may perhaps go without saying that Dr. Crick is concerned with refuting the vitalist position, which he considers to be all too prevalent, even in biological circles.

Vitalism is the view, according to Dr. Crick, that the growth and behavior of living systems cannot be understood solely in terms of physics and chemistry but are directed by some special force. Such a viewpoint arises, he believes, because there are processes not easily explained by physical and chemical concepts, principally in three areas of biology: the borderline between the living and the nonliving, the origin of life, and the nature of consciousness.

Dr. Crick is aware that even the creation of a simple living organism from chemical elements may not constitute a sufficient refutation of vitalism, since it can be argued that the synthetic system was lifeless until the vital force took over its workings. Hence, it is necessary in addition to be able to explain the behavior, even of such a form of life, on the basis of physical-chemical laws.

While the facts and theories of

molecular biology are presented only as they throw light on the three areas of biology crucial to the debate on vitalism, there is considerable overlap with the subject matter of *The Thread of Life*. It is surprising that Dr. Crick presents to a university audience a more simplified description of the structure and functions of DNA than Dr. Kendrew to a television audience.

On a question like vitalism, which involves philosophy (if not faith), rather than science, it is possible to persuade but hardly to prove. Dr. Crick is so committed, in opposition, that at times he stretches the implications of present knowledge and falls into a shrillness of tone, such as is evident in the closing sentence of the last lecture: "And so to those of you who may be vitalists I would make this prophecy: what everyone believed yesterday, and you believe today, only cranks will believe tomorrow."

The Basic Laws of Physics

Dr. Kendrew notes that in biology, "we deal with a very large and complicated range . . . of brute facts . . . And what we want to do is to link [them] together into a simple unified scheme." In contrast, the physicist explains "rather simple observations by a very sophisticated and subtle intellectual analysis." It is likely that Richard P. Feynman, '39, Nobel Laureate in nuclear physics, would be amused and might even agree. His book, *The Character of Physical Law* (M.I.T. Press, Paperback Edition, Cambridge, Mass., 1967, 173 pp., \$2.45), is precisely a sophisticated and subtle analysis of the physical laws that underlie all scientific principles.

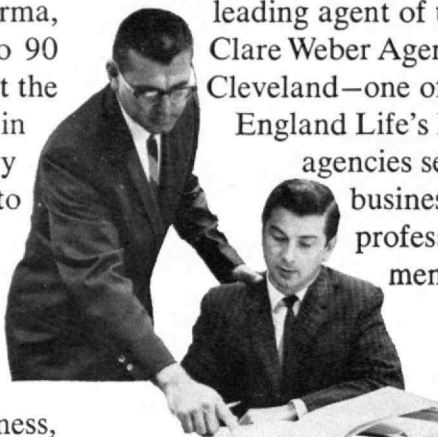
The activities of which this book is the culmination are as symbolic of the Twentieth Century as the lectures of Michael Faraday were of the Nineteenth. Dr. Feynman delivered the Messenger Lectures at Cornell University in 1964. The lectures were taped for television broadcast on BBC, which published the original edition of the book in 1965. Subsequently 16-mm. films were made from the tapes.

The scope of the book is evident from the titles of some of the chapters: The Great Conservation Principles, Symmetry in Physical Law, The Distinction Between Past and Future, Probability and Uncertainty. The reader of the book, no less than the viewer of the films, succumbs immediately, willingly, to Dr. Feynman's warmth and humor. The originality of his approach (for example, deriving the second law of thermodynamics from a ratchet-and-pawl on a rotatable shaft) and the keenness of his insights into the basic laws of physics delight and stimulate the imagination.

That was back in 1964 after William H. Koptis had spent 14 years as the owner-operator of a sporting goods store in Parma, Ohio. "I was working 80 to 90 hours a week," said Bill "but the big discount stores moved in and service became secondary to prices. I wanted to get into something where I would have independence and an opportunity to apply my philosophy and public service. After much thought I selected the life insurance business, and then New England Life."

Bill made his move in 1965. During that year he established the finest first-year record of achievement in the entire Company and received the New

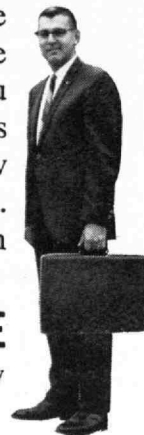
England Life Rookie of the Year award. In 1966 his success continued to the point where he is a leading agent of the E. Clare Weber Agency in Cleveland—one of New England Life's larger agencies serving business and professional men.



Bill Koptis of the Clare Weber Agency in Cleveland (on the left), reviews an insurance proposal with Louis Zeitler, President of the Die Matic Corporation in Cleveland.

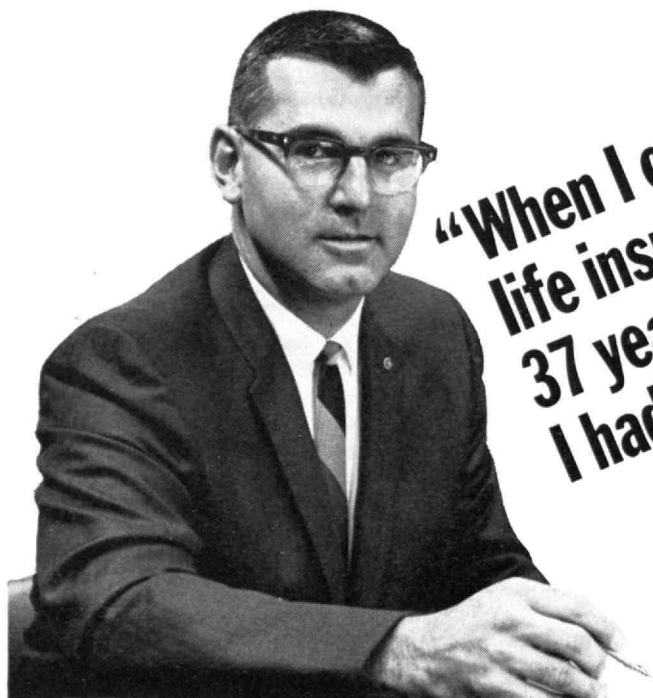
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Congressional Preview

By Corbin Gwaltney

Elsewhere in this issue, a special report called "Life with Uncle" (Sam, that is) gives many intriguing facts about the dimensions and scope of the Federal government's support of America's colleges and universities—private as well as public.

If anyone has any lingering doubts about the dependence of U.S. higher education upon a steady flow of dollars from Washington, this report—and the others in this issue—will dispel them. Jerome B. Wiesner especially deals with this question as it affects an institution such as M.I.T. in his essay on The Federal Presence at M.I.T. on page 65.

As he says, any diminution in the flow—or even any slowdown in its rate of growth—would be of immediate and direct concern on the nation's campuses.

Such a slowdown appears inevitable this year. At the present writing, the funds for aid to education *per se* appear to be somewhat more in jeopardy than those which support education through university-based basic research, which is a larger factor by far at M.I.T. than at most universities.

The slowdown, if it occurs as expected, will be attributable to a combination of several powerful factors. One is the war in Viet Nam and its dampening effect upon government budgeting for domestic programs. Another is a new fiscal conservatism on the part of certain key committees in Congress, such as the House appropriations subcommittee that holds the pursestrings on the Department of Health, Education, and Welfare, from which come large portions of the Federal spending in colleges and universities. Another is a feeling, widely held in Washington, that after several years of record-breaking legislation in the field of education, it is time, as President Johnson put it a few weeks ago, for a "careful analysis" of the new programs and their effectiveness, "so that we can provide a full accounting to the Congress and the American people of our successes and shortcomings."

The President's Requests

Hence, when Mr. Johnson sent his education message to Congress a few weeks ago, he devoted most of his recommendations to the strengthening of education programs that already are in

operation. The President put a fresh new face on his proposals, of course: "I do not recommend more of the same," he said, "but more that is better: to solve old problems, to create new institutions, to fulfill the potential of each individual in our land." Actually, however, the brand-new ideas were few.

Among them were these proposals that would affect the colleges and universities:

- A schedule of Congressional appropriations for education that would be compatible with academic timetables. As things are now, Mr. Johnson said (echoing many persons in education and in state governments), Congress often puts off its appropriations until the closing days of the legislative session—too late to be of much value in the planning stages of most education schedules.

- A program to expand a number of present Federal activities which support the training of teachers and to start new activities in support of the training of administrators and other education workers. Institutions of higher education would play a major part in this, using Federal funds to improve their training of education personnel for all levels of schooling.

- A \$2.5 million analysis of how well the Federal government's support of education is achieving its objectives.

- The establishment of a "public television" corporation to support noncommercial broadcasting. The concept of such a corporation was presented earlier this year in a report of the Carnegie Commission on Educational Television, headed by James R. Killian, Jr., '26, Chairman of the Corporation of M.I.T.

With these exceptions, however, the President's proposals were concerned mostly, as he put it, with "revising, improving, and consolidating existing programs." With the gigantic steps taken in the establishment of such programs in the 1960's, of course, simply maintaining the present activities is a task of considerable magnitude. Among the President's requests:

- Extension, for five more years, of the Higher Education Act of 1965. As presently written, this act expires in June, 1968. It is a big, omnibus law that provides a variety of aids and support to higher education. By extending it now—a year early—Mr. Johnson believes Congress can contribute substantially to the ability of colleges and universities to plan ahead, rather than forcing them to wait nervously for last-minute action.

- A five-year extension of the National Defense Education Act. This key

legislation also expires in 1968. The President requested several changes, including the establishment of a revolving loan fund that would enable colleges and universities to capitalize fully their student loan funds.

- Expansion of the Teacher Corps to a total of 5,500 volunteers by the 1968-1969 school year.

- Establishment of an experimental program for "developing the potential of computers in education."

- Increased federal support of the National Foundation on the Arts and Humanities.

- Support for last year's International Education Act, which the President called "an historic measure recognizing this nation's enduring belief that learning must transcend geographic boundaries."

In all, the Johnson program for education—including its provisions for elementary and secondary, as well as for higher, education—would cost \$11 billion in fiscal 1968.

Add to this the funds requested by the President for university-based research, and the total reaches some \$13 billion. Nearly \$5 billion—approximately 37 per cent—would involve colleges, universities, and their students. It breaks down as follows:

- For support of undergraduate, graduate, and professional training—\$1.9 billion.

- For university research, not including work in the field of education—\$1.5 billion.

- For academic facilities, equipment, and general aid to colleges and universities—\$1.2 billion.

- For training elementary and secondary-school teachers—\$180 million.

- For research in education and development of curriculums—\$164 million.

How successfully these programs will negotiate the Congressional waters this year will depend upon the war in Viet Nam and its effects upon domestic spending and, quite possibly, on a shift in the balance of power on the House appropriations subcommittee responsible for handling programs in the Departments of Labor and Health, Education, and Welfare. Last year, Congressmen identified as "liberal" held a 5-4 edge. This year, the balance has changed to 5-3 in favor of fiscal "conservatives."

The subcommittee is chaired by a liberal Democrat, Daniel J. Flood of Pennsylvania. But the other members are dominated by Congressmen who have not been friendly to "Great Society" spending, and therein may lie complications for the President's education programs.



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Puzzle Corner

By Allan J. Gottlieb, '67

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I am afraid that I must begin with an apology. Before this column appears in print it must go back and forth between *Tech Engineering News*, Technology Review, two different printers, and me. Somewhere in the shuffle for last month's installment a minor calamity occurred—everything, and I mean everything, got lost. All the letters I was saving for old times' sake are gone but not forgotten. Also, several submitted problems and solutions are currently somewhere in never-never land. Of course, I would be grateful for any resubmittals, and if anyone sees a gray envelope labeled "Puzzle Column" please send it to me, Allan Gottlieb, Box 4380, 362 Memorial Drive, Cambridge, Massachusetts 02139.

Problems

♦ 63—The following letter was sent to Technology Review:

Gentlemen:

Here is a problem for the student who runs the puzzle-section of the Technology Review. I don't happen to have a copy of the Review at hand, so cannot recall his name, but I do enjoy this section of the publication. The problem appeared on a recent Graduate Record Examination, so there must be a quick and easy solution:

What is the remainder when 5^{100} is divided by 101?

I have worked the problem out by repeated iterations—first breaking up 5^{100} into $5^4 \times 5^{96}$, dividing 5^4 by 101 and discarding the 6; etc., etc., etc. The remainder turns out to be 1. What I am interested in is the method the GRE must have expected, since my method takes much too long for their examination.

Sincerely,

(Mrs.) Nancy O. Klock, '37

Thank you, Nancy. By the way, Je m'appelle Allan Gottlieb.

64—The following problem was submitted by H. Kelsea Moore, '32:

Dear Mr. Gottlieb:

The following problem is an old chestnut, at least 50 years old, though I have never seen it in print anywhere.

A courier is in the rear rank of a column one mile long. He leaves his position to deliver a message to his commanding officer in the front rank, and then returns to his original position, arriving there precisely at the same moment that the column has moved ahead one mile. How far did the courier walk? (It must be assumed that the courier walked at a constant rate of speed, and the column at a constant though different rate of speed.)

Here is a rate problem where time and rate of speed are unknown.

Very truly yours,
H. Kelsea Moore, '32

65—Peter L. Eirich, '69, wants to see 24 dots arranged to form 24 line segments of four dots each.

66 and 67—Chess problems seem to be the most popular so here are two more:

Dear Mr. Gottlieb:

One of M.I.T.'s alumni has just passed along to me his copy of the January issue of the Technology Review in which, on page 11, I have read your solution to problem 2. By a strange coincidence I have been skimming through my latest chess book (about #2,800!) by Horowitz and Rothenberg, *The Personality of Chess*, and on pages 200-1 and 224-5 I find reference to similar problems.

The first proposes: "Rearrange the eight pieces so that a maximum number of squares, including those on which the pieces are situated, is guarded" (otherwise, apparently, innumerable solutions).

(66) The second proposes: "same as above, except that you are allowed to place the two bishops on squares of the same color."

(67) And finally, a third proposal your readers may want to try: "Arrange the eight pieces so that a minimum number of squares is guarded. (The count must necessarily include absence or presence of guard of the squares on which the pieces themselves are situated.)"

This leads me to suspect there may be other references which, if I should uncover them, will be forwarded to you.

Very truly yours,
Robert Sinnott
Norwell, Mass.

Speed Department

68—How many solutions are there to the subtraction problem below:

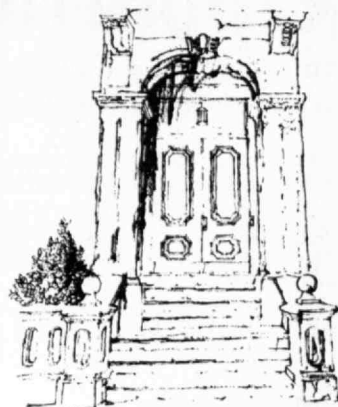
WASGEORGE
PHILLIES
—
AHACK

69—Assume s consecutive hours are wasted each day by eating and sleeping, etc. The remaining are divided into working (at d dollars per hour), commuting, and listening to hi-fi. The pleasure obtained by listening to hi-fi is $10 \cdot \log_{10}(m)$ pleasure units per hour where m is the number of dollars invested in the hi-fi. The annoyance of working an h hour stretch is $ah^{3/2}$ (i.e., the pleasure is $-ah^{3/2}$ pleasure units). It takes c hours to commute from home where the hi-fi is located to work. Assume you will live another y years and have no hi-fi at present. How should you divide your time in order to maximize the total pleasure of your life?

Solutions

Due to the above mentioned mix-up, I shall defer giving solutions for February problems until June.

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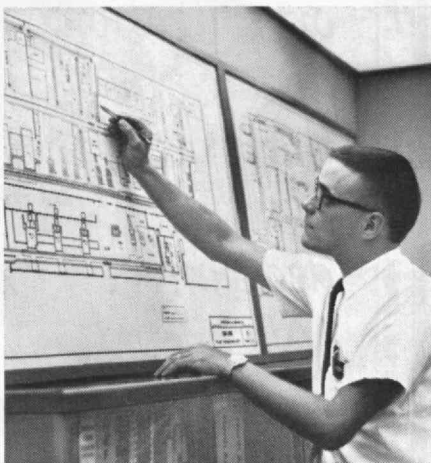
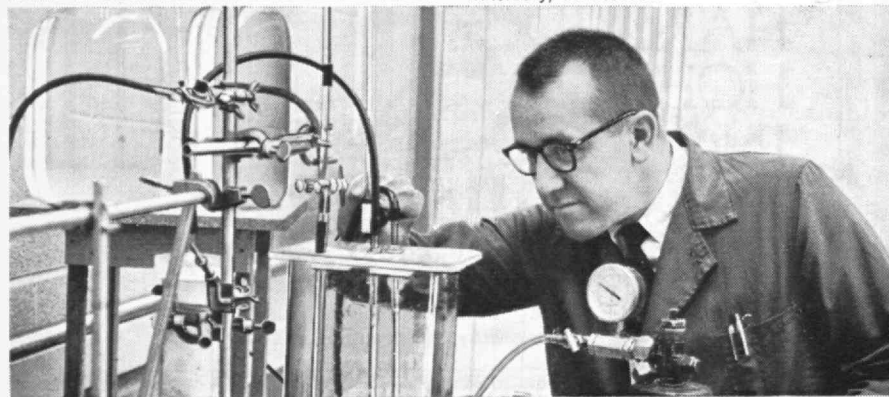


Top: LUIS LOZANO (BS Met. E., Brooklyn Poly. '61) is research metallurgist at Anaconda American Brass Company's research and technical center.



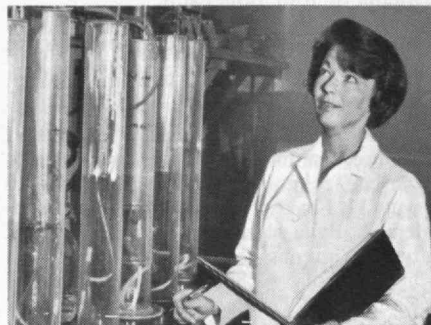
Left: PETRUS DUTOIT (BS Mining Engrg., Montana Tech., '56), mining engineer, at the controls of a raise boring machine in the Mountain Con mine. This mine has the latest in underground mining equipment.

Below: LAWRENCE KENAUSIS (BS Chem., Holy Cross '53; MS Chem., Boston College '55; PhD Chem., U. of Penn. '61) is senior research metallurgist at Anaconda research and technical center in Waterbury, Connecticut.

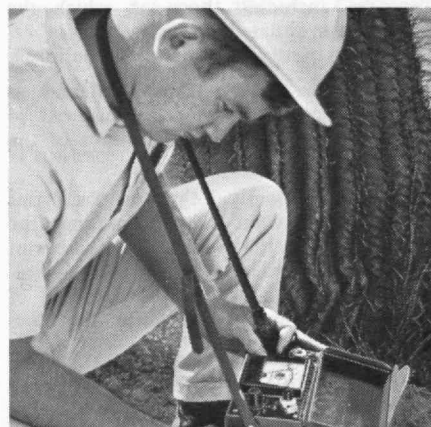


Top: GEOFFREY IRELAND (BSME, U. of Louisville '63) is assistant plant engineer at Louisville works of Anaconda Aluminum Company.

Below: ROBERT SWIRBUL (BS Bus. Ad., U. of Tampa '58), center, district manager of Dallas sales office of Anaconda Wire and Cable Company, reviews cable specifications with power utility personnel.

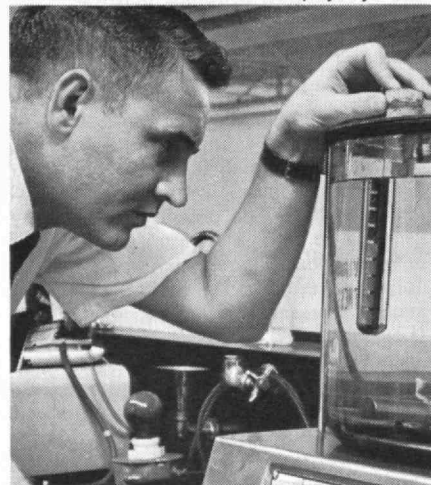


Top: JUDITH HIHNALA (BS Bact., Montana State '63) studies bacterial leaching of copper and zinc ore and concentrates in extractive metallurgical research laboratory.



Top: GLENN ZINN (BS Geol. E., Mich. Tech. '66), geophysicist with the geophysical department's southwest office in Tucson, Arizona, is studying toward a master's degree in geophysics at University of Arizona.

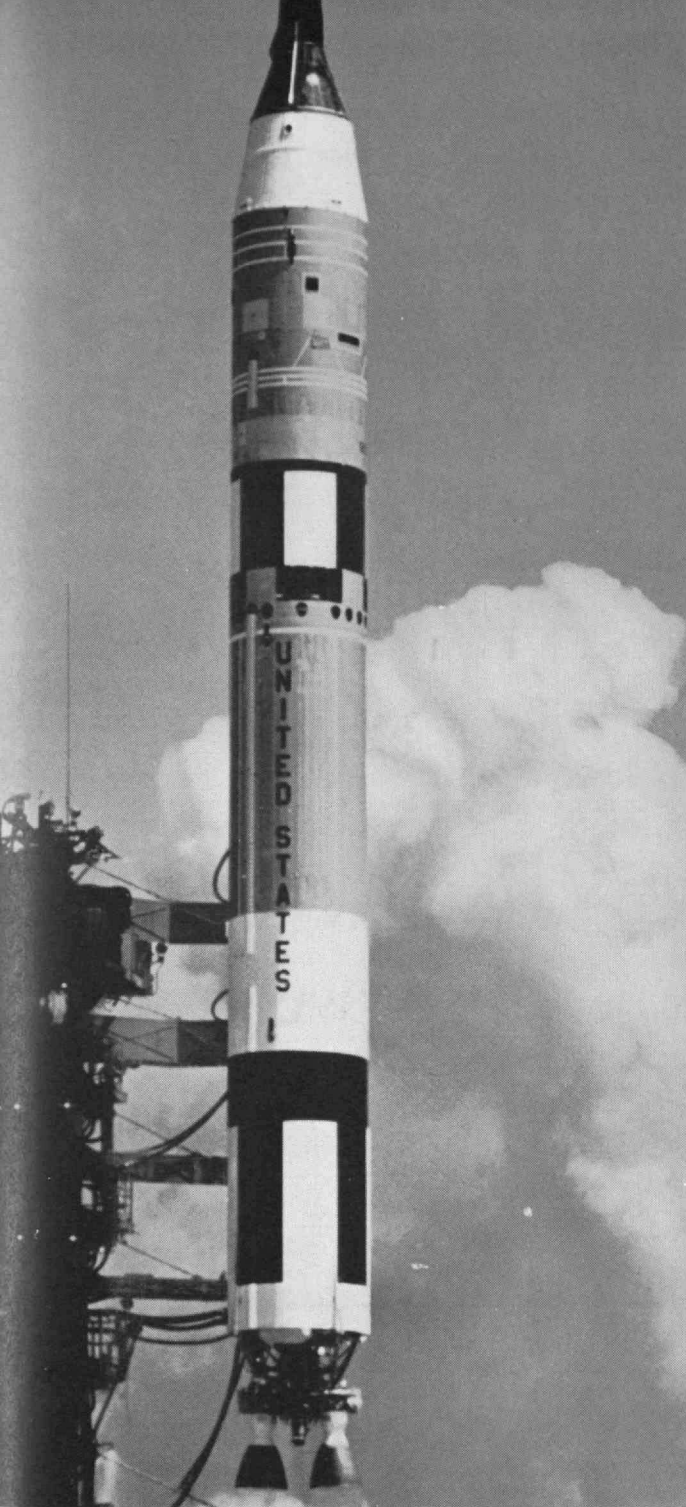
Below: FRANKLIN ANDREWS (BS Math., Northern Ill. U. '62), manager—quality assurance at Sycamore plant of Anaconda Wire and Cable Company, checks environmental stress crack test of polyethylene.



If you would like more information about the opportunities at Anaconda, or would like to apply for employment, write to: Director of Personnel, The Anaconda Company, 25 Broadway, New York, N. Y. 10004.

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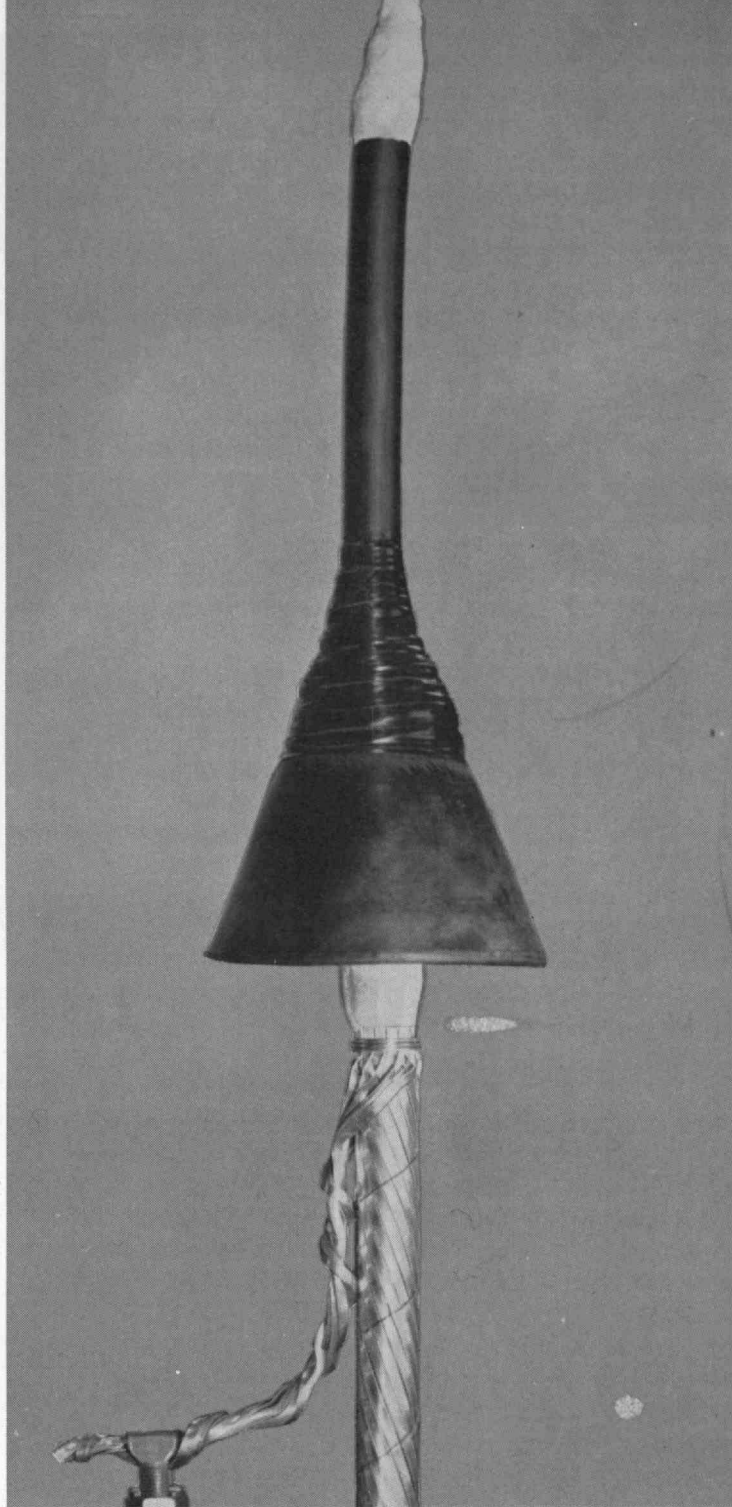
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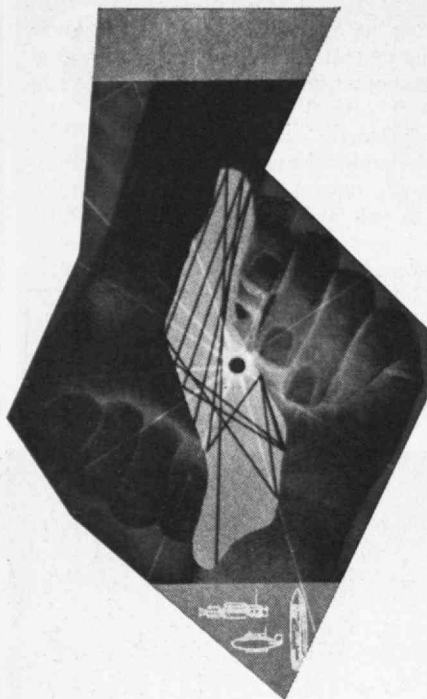
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Contact Ken Friedlein, Scientific Placement, Allison Division of General Motors, Indianapolis, Indiana 46206, Dept. 402.



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Technology
Review
April, 1967



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—Pliny.

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Anthony D. Kurtz, 1951

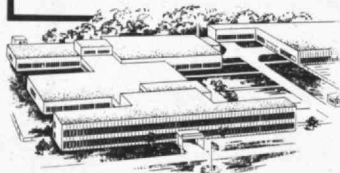
Ronald A. Kurtz, 1954

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Letters on Review

To Reach Young Minds

To the Editor:

It has been my privilege to read the paper entitled "Education and the Need to Know" (Technology Review, January), and I must tell you how thrilled I am by what the authors are attempting to do and the results achieved so far. I lecture here in one of our universities and have always despaired to feel how far apart my students and I are, how many better minds than mine could answer their questions. I am therefore delighted to learn that someone is working on a scheme that will help us to reach young minds.

LEON A. FRAIKIN, '31
New York, N.Y.

Alumni in the White House

To the Editor:

In Alumni in the White House (January, page 61), you forgot something. Who are the White House Fellows anyway?

EDWARD B. ROBERTS, '57
Cambridge, Mass.

Oops. Harold P. Smith, '57, and Walter J. Humann, '59, are the Fellows.
—Ed. (red-faced).

A Lucid Exposition

To the Editor:

As a practicing materials scientist, allow me to congratulate Mr. Boehm on his article, "Wanted: Materials Which Do Not Exist," which appears in your February issue. I was particularly happy to learn of the National Academy of Sciences poll naming my chosen discipline as one most worthy of support.

You might be interested that I have been giving your article to people who have asked me what I do for a living. It is a most lucid exposition of the advances and challenges facing us.

ALAN R. ROSENFELD, '53
Columbus, Ohio, 43212

"A Penny Saved"

To the Editor:

Please discontinue sending the Review. It is a remarkable magazine, but I have more reading than I can take care of! Suggest you put a postal in each issue and ask the recipient whether he wishes to receive this excellent publication. "A penny earned is a penny saved!"

MRS. EMIL E. MUESER, '16
Mountain Lakes, New Jersey, 07046
A backhanded compliment, and the Review only hopes not to have too many more like it. Really we want to get in front of all that reading.—Ed.



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Richard E. Boraks	'59 (XXII)	Hartford
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The Proper Study: Science at Expo '67

It has something for everyone,
but the fair's unique claim
is its emphasis on Man's work

By Henry I. Bolker



Henry I. Bolker is assistant head of the Organic Chemistry Division of the Pulp and Paper Research Institute of Canada, and research associate in the Department of Chemistry at McGill University. He has been a member of the Board of Directors of the Youth Science Foundation (formerly the Canadian Science Fairs Council) since 1961, and is vice-chairman of the Editorial Board of the Foundation's *Science Affairs*.

In the good old days, before 1945, science was largely a matter of indifference to a general public which now seems to have exalted science, and those who work at it, to the status of major forces which shape the present and future world. Nevertheless, few scientists believe that laymen understand much of what science is really about, though some are eager to promote understanding. It therefore seemed natural that the World's Fair at Brussels should have had an "Atomium" as its centerpiece and that Seattle should have featured the "Cathedrals of Science."

Yet, at Expo '67, which will open in Montreal on April 28, there will be no separate science pavilion. At Montreal, Man himself will stand at the core of the exhibition. His way of life, his aspirations, his character—both his virtues and his failings—will be exposed to view through art, film, entertainment, and exhibits. Science and technology will be there; but, by and large, they will appear only where necessary to show the interaction of man with his environment, both natural and artificial.

Indeed, the theme of Expo '67 is a lofty one—"Man and his World"—and the wonder of it all will be to see how the organizers and planners have hardly sacrificed an iota of integrity in presenting it, and how, moreover, they have succeeded in persuading diverse national and industrial exhibitors to adhere to it, and to suppress their own narrow interests.

The Origins of Expo

Expo '67, the Canadian Universal and International Exhibition, Montreal (Quebec, Canada) 1967, surely owes its existence in Montreal more to one man than any other—Montreal's Mayor Jean Drapeau. Monsieur Drapeau is the sort of mayor who invites the tired adjectives "colorful" and "flamboyant"; applied to him, they are no mere products of a journalist's hasty pen.

Just as Jean Drapeau has been shaping Montreal into a real metropolis, with a place for beauty as well as commerce, so has his attitude shaped the fair. Although he denies playing any role in the planning and management of Expo, the high-principled, uncompromising tone of the whole thing surely derives from his influence, his presence in the background. Its success will be his, for he is more than its spiritual father, although he achieved this fatherhood in the face of much doubt of his ability to do so.

It was in 1962 that Mayor Drapeau flew off to Europe, with the purpose of persuading the International Bureau of Expositions to permit the staging of a world's fair in Montreal in 1967. He had at least two good points in his favor: that 1967 was the year of the centennial of Canadian Confederation; and that no international exposition of the first category had ever before been held in North America. Three factors worked against him: that time was running short for planning and construction; that 1967 was too soon after New York's World Fair (but New York, a commercial fair, did not operate under the rules of the International Bureau of Expositions); and that the U.S.S.R. had previously made a bid

for an exhibition to be held in Moscow in 1967, the year of the 50th anniversary of the Revolution. I don't know how or why it happened, but the Soviet Union withdrew its application, and Drapeau was able to return home in triumph.

His problems had only begun. He still had to face local skepticism that the project could be completed in the required time, and the answer to those skeptics will not be given until April 28. He also had to find a site for the fair, and to solve this problem he outflanked the land speculators by the typically ingenious solution of creating new land.

Development of the Theme

One more problem remained: aside from the usual food, amusement and souvenir concessions, Expo could not and would not be a commercial show or a trade fair. It needed a grand theme, and the job of inventing one was turned over to a group of scholars and scientists who met in the quiet seclusion of a country estate. Presumably after lengthy contemplation, they found their text in the writings of Antoine de St-Exupéry:

"Etre homme, c'est sentir, en posant sa pierre, que l'on contribue à construire le monde."

"To be a man is to feel, while laying your own stone, that you offer it to build the world."

"St-Ex," as French-speaking intellectuals fondly call him, was an airplane pilot, whose writing reflected a flyer's perspective on the world. He is not as well known in English as perhaps he should be, except through two books: a children's story, *The Little Prince*, and a philosophical volume *Wind, Sand and Stars*. The quotation above was taken from the latter, which was first published in French in 1938 under the title *Terre des Hommes*.

Thus *Terre des Hommes* became the theme of Expo '67, and here arose the first of the linguistic inconsistencies which have turned up occasionally in this bilingual exhibition in a bilingual city. For the official translation has been made as "Man and his World," while most French-speaking people will admit, when pressed, that a more accurate version of the original would be "The World of Mankind." Perhaps one ought not to quibble about such things; the point is clear enough: that Man, not the world, is the primary object of study.

That a French author should have been chosen as the source of the theme is possibly a reflection of the present political climate in Quebec, where one manifestation of the desire to emphasize cultural differences between Quebec and the rest of Canada has been a return to stressing the old kinship with France.

Whatever its political overtones, the important point is that the theme really and truly will pervade the entire exhibition. Nowhere will it be presented as comprehensively as in the theme pavilions themselves, which will be more extensive than the theme pavilions in any previous world's fair. Each pavilion has a "story line" which dictates the nature and relationship of its exhibits, and the exhibit material was gathered to fit the story line, not vice versa. When the planners of the exhibits

needed specific material from a particular country, they accepted no substitutes or compromises. This attitude was so surprising to many countries which had previously participated in world's fairs that at first some nations could not understand what was wanted. Some proposed to fill the floor space allotted to them with whatever propaganda or industrial products they thought suitable. It took some doing to persuade these countries that all the story lines were written in a *perspective planétaire*, that the story and its interpretation were more important than any nationalistic propaganda.

Guy Dozois, Deputy Director of the Theme Branch, feels that if Expo '67 gives a new style ("*un nouvel élan*") to future world's fairs, it will be through this concept of developing a real story in the theme areas and restraining nationalistic ends.

Science and Technology in the Theme Pavilions

Within the main theme, there will be six principal thematic subjects, and, although Man is at the focus in all of them, science and technology will creep into each. Even "Man the Creator," primarily an exhibition of painting, sculpture and photography, will bow in the direction of technology with a section on industrial design.

On the other hand, "Man in the Community" will take the lead from "Man the Creator" and will use the media of art to present thought-provoking views of sociological problems. A visit to "Man in the Community" will probably stimulate any working scientist or engineer, for its avowed purpose is to be concerned with the effects of technology on the human condition. It will present the problems—but no solutions—raised by the "population explosion," the "information explosion," the change in patterns of work and leisure, and the growth of megapolis.

Other problems, such as the pollution of air and water, will be presented under "Man and his Health," although the main purpose there will be to offer the visitor the idea of his own responsibility for his health as an individual and for the health of his fellow men. Exhibits and graphics will show basic concepts of public health and disease prevention, while live actors will simulate operating-room and clinical procedures.

Biology will enter the theme again in "Man the Explorer," where "Man and Life" will be one of four sub-themes. "Explorer" will be taken in its broadest meaning, so the modern explorer is, in fact, a scientist. Yet there will be no fundamental physics or chemistry here; rather, besides biology, the subjects covered will be space science, oceanography, and exploration of the polar regions. Many of the things shown will be old-hat to most scientists, but few will be able to resist the temptation to see how these subjects are presented.

But of all the theme pavilions, the most intriguing to the scientist will be "Man the Provider." Even if one bypasses its sections on "Resources for Man" and on "Progress" ("a hardware show" in the definition of Karl Boldt, the co-ordinator of "Man the Provider"), one will be driven to pause at the title of the third part, for it is called "Man in Control?"

My own first reaction to it was to ask whether the question mark was a misprint. I soon found out that it was not, and its implication is mainly sociological. Starting with the premise that man can now make nearly anything he needs and do nearly anything he wants to do, this exhibit will ask "Is man in control? If he is not, then why not?" To set the stage the visitor will be shown how control implies three factors: observation, decision, and the initiation of action. There will be concrete illustrations of how man uses technology to extend his own senses and to gather, store, and reproduce information. However, decision-making will hardly be touched upon, except with respect to air-traffic control; I think the implication here will be that man himself is responsible for major decisions, although an automated factory will show how the entire control mechanism can operate without human intervention.

Next there will be a section on "Control in Economy," which will emphasize the difference between a rich and a poor economy and will leave the visitor to come to his own conclusions. ("This may be a bit of a tear jerker," Mr. Boldt admitted to me.)

The final area, which fascinates me most, will also aim at leaving the visitor with unanswered questions. It will begin with two statements:

"The benefits of progress are more apparent collectively: as a group we live more securely—more productively. The ills of progress are more apparent individually: some of us suffer because of change."

Then there will be a huge photograph of the interior of a television studio, and the caption will ask: "Do you think technology allows us to communicate or be diverted more easily?"

A photograph of a space-exploration vehicle will ask: "Do you think technology allows us to explore the unknown or avoid the familiar?"

There will be nine more panels, of which my favorite will say: "Do you think technology permits you to listen to the universe or prevents you from hearing yourself?"

Perhaps the average visitor will hurry by without giving these panels a second glance; but if one in a thousand stops and thinks about them, all of Expo will have been worth while. For, though these lines may not be poetry and may even seem trite in conception, they will sum up what Expo has to say about science and Man.

If one in a thousand is made to pause, it will not really matter that the theme pavilions will not try to teach the Second Law of Thermodynamics or the elements of quantum physics, nor that science and scientists will not be glamorized beyond recognition.

This is not to say that no compromises were made. Professor Dozois told me that in the beginning the Theme Branch was plainly more ambitious than practical. They tried to say too much, then realized that limitations of space would dictate deletions. Then they had to tread the fine line between Dozois' order never to underestimate the visitors and the recognition that only a small portion of the visitors would be university professors or even college graduates. This meant that every statement made had to be reasonably comprehensible,

but they insisted that truth never be sacrificed to comprehensibility. (As Professor Dozois said, "We must at least try to reach out to '*la ménagère de l'est de Montreal*.'") Finally, even after design and construction were well underway, limitations of budget dictated a considerable amount of additional simplification. However, all cutting and simplification had to be approved by the scientific specialists on the advisory committees. The procedure must have precipitated more than an occasional conflict, but only one adviser, I was told, ever resigned over a matter of principle.

Science in the National Pavilions

This fierce integrity seems to have been carried through to the national pavilions—at least those I had the opportunity to investigate. I think that the management of Expo succeeded in intimidating even the strongest of them. Early in the game, the management called together the Commissioners of the national and industrial pavilions, informed them of the theme and the plan for its implementation, and gave them some advice:

"It is strongly suggested by the Canadian Corporation for the World Exhibition management that participants in Expo '67 follow the theme philosophy in their presentation of exhibits and pavilions inasmuch as it is feasible. . . . Universal exhibitions must not be a static showcase for the arts, the sciences or technology. At all costs, any temptation to show the latest 'hardware' must be resisted. The major effort should be to concentrate on subjects and modes of presentation which are likely to stir the imagination. The management of C.C.W.E. hope that participants will take these considerations into account so that a continuity of expression and purpose may be achieved effectively to convey the message of its theme, *Terre des Hommes*."

The lecture seems to have had its effect, because not one of the principal national pavilions will have more than the least hint of a "trade show" approach and this, too, will be in sharp contrast with previous world's fairs. While New York was nearly all commercial and Seattle was perhaps less international than local, even Brussels, a first category exhibition, had its trade aspects.

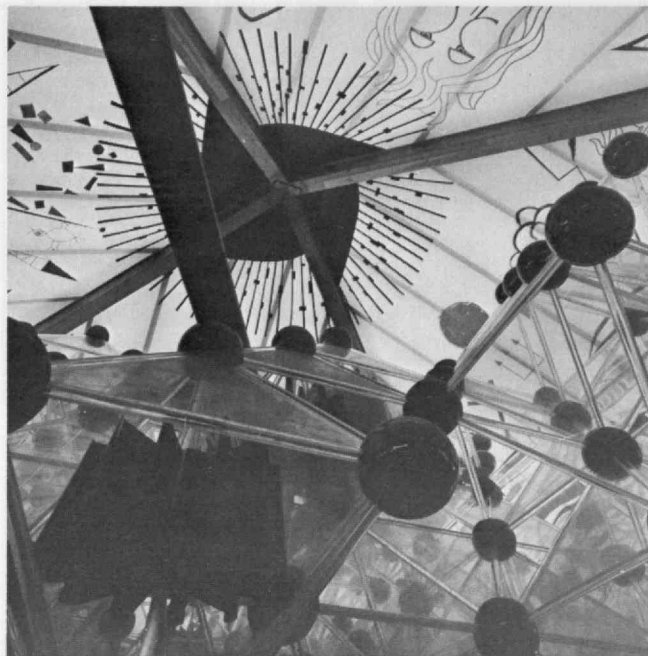
In Brussels, for example, the British had two pavilions: one was a government-sponsored exhibition on the theme while the other was frankly and openly a trade show. In Montreal the single, large British Pavilion will show no products of industry; rather, in one of its five main sections, it will try to emphasize British industrial research and bring out the interrelation of the scientist and industry. It will go even farther and try to explain the place of the scientist in our entire modern civilization—that in the scientific age the scientist carries a heavy burden of responsibility. In another section, called "The Genius of Britain," it will pay homage to Britons who have contributed to world knowledge and will feature more scientists than writers, artists, and musicians. Among others it will honor Cockroft, Dorothy Hodgkin, Roger Bacon, and William Harvey as creators of scientific knowledge; and Watt, Stephenson, Dunlop, and Whittle as those who applied it.

The Soviet Union will have a huge pavilion, whose verbose theme "All for the good of Man and in the name of Man" ranges through culture, art, literature, medicine, and social life as well as science. In science, as might have been expected because of Soviet success in these fields, the exhibits will feature oceanography, atomic energy, and space. I have been told that, although the level of presentation will be aimed at the layman, means will be at hand for any scientist or engineer who wants to probe more deeply to do so. The oceanography exhibit will show a bathyscaphe, models of research ships, and some results of research, such as relief maps of the bottom of the ocean. The atomic energy exhibit will, of course, stress only peaceful uses. One can anticipate, however, that the space exhibit will draw the biggest crowds, not only because North Americans will be curious about it but also because they will be able to sit in a 72-seat room designed to look, on the inside, like a giant spacecraft. Once seated in the "craft" they will be taken on a journey into space, will be given some impression of the feeling of weightlessness, and will see how the moon looks in close-up and how the earth appears from outer space. Outside the "spacecraft" there will be models of Sputnik and Lunik and photographs of the moon and other cosmic phenomena. Several of the cosmonauts are even expected to be present in person at some time during Expo. If all this appears so far to be somewhat superficial, it will be more than compensated for by a detailed exhibit showing the entire history of Soviet rocketry. Just as the United States had its Goddard, Russia had Konstantin Tsiolkovski, who actually began his experiments in rocketry in the late Nineteenth Century. (He died in the 1930's.)

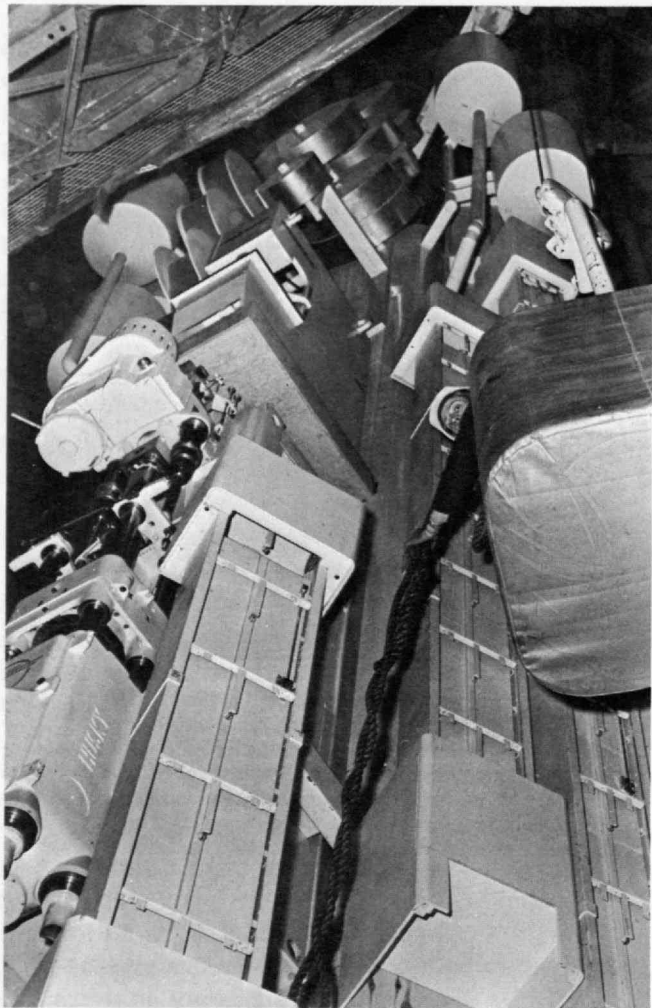
In contrast, space science will be the only science shown in the United States Pavilion and the display will be confined to the Apollo program. The exhibit will offer a lunar landscape and a lunar excursion module, as well as some components that have actually been flown. The whole exhibit will be kept as uncomplicated as possible in line with the policy of presenting only "showable" things. The designers of the United States exhibits feel that there would be no use trying to show any more science than this. Previous experience, I think, has led them to believe that public comprehension would not be up to absorbing any serious science.

Perhaps the scientists themselves drove the designers to this position. In the early stages of planning they approached a number of university scientists and asked how to solve the problem of presenting science. The scientists all answered that there was no problem, and what was to be done was obvious—but few could give any useful, concrete suggestions. So the United States Pavilion has the theme "Creative America" and will feature art and entertainment. Like most other pavilions it has a theater, but it will show only one film, "Children's Games," which will demonstrate the universality of the patterns of children at play.

Yet, as an old admirer of Buckminster Fuller, I cannot fail to mention that there is one thing about the United States Pavilion that is all technology: the build-



Lighthearted approach to nuclear energy in the Canadian pavilion. The lattice in the foreground represents a crystal of uranium oxide, complete with flashing lights to symbolize steps in the production of electricity. In the background is the ceiling of the exhibit, designed by Normand Hudon; this represents, in terms of fantasy, the principal sources of renewable energy—the sun, the wind and the tides.



Automatic factory, shown here in the final stages of preparation, appears in the theme pavilion "Man the Provider." It illustrates how an entire control mechanism can operate without human intervention.

ing itself—the largest geodesic dome ever constructed.

As a masterpiece of technology, the United States Pavilion will probably be challenged only by the Pavilion of West Germany, with its remarkable steel-net-and-plastic tent-like roof that was shipped from Germany in rolls 30 by 80 feet, each the length of a railway car. Within the German Pavilion, the exhibits will be based on the Expo theme and all aspects will be related to life in Germany. Among many other things there will be a number of items of special historical interest to scientists: Roentgen's first x-ray apparatus, the original Magdeburg spheres, Hertz's equipment for the study of electromagnetic radiation, and Otto Hahn's laboratory bench. As for technology, there will be the first electric generator (invented by Ziemans), the first electric locomotive, the first gasoline motor, the first diesel motor, and the first automobile—a Daimler-Benz—ever made with a gasoline motor. Perhaps the most fascinating modern invention on display will be Wankel's engine—a motor which operates with a rotating piston.

Like the British, however, the Germans will honor scientists rather than science and will demonstrate their special pride in the 26 Nobel laureates who were born in Berlin—a forgivable touch of propaganda.

Actually, I have found only one national pavilion which will have a comprehensive exhibit on science. The entire third floor of the French Pavilion (theme: Tradition and Invention) will be devoted to showing an impressive picture of current scientific research in France, with contributions from industry, government, and academic laboratories. The 80 exhibits have been collected and co-ordinated by the Centre National de la Recherche Scientifique (C.N.R.S.) and are intended to stimulate the interest of both lay and professional visitors. They will include laboratory demonstrations, models, slides, and films, and many will bravely present rather abstruse and complex subjects, including spectrometry in the far infrared region, polymerization by heterogeneous catalysts, and some concepts of solid state physics. I have been told that the 15 to 18 experiments to be shown will be absolutely authentic. Some will make a real scientific point and will probably be understood only by visiting scientists, while others, at the same time as they make their point, will be spectacular enough to catch the more fleeting attention of the general public.

Since no other country is making a comparable effort to show off its current scientific research, there must be a unique reason why France has chosen to do so. It probably lies in a special situation that exists between France and Canada, which have recently signed an agreement for the annual exchange of senior scientists. Early this year, quite apart from Expo, France opened in Montreal its France-Quebec Scientific and Technical Documentation Center. In a way, this may be but another manifestation of nationalistic trends in Quebec, but my impression is that it goes much farther.

Canada, the host country, has the largest and most expensive pavilion at Expo and will show itself as a land of what was originally called "Challenge and Response."

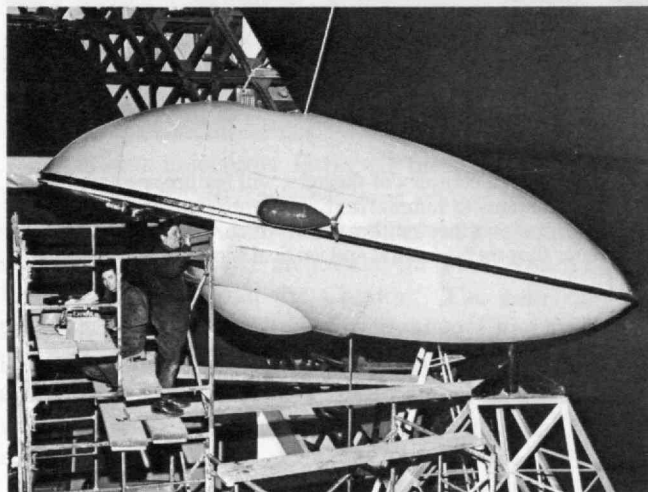
Here was another problem of language, a linguistic trap for bilingual Canada. While there is a French word for challenge in the sense of "I challenge you to a duel," there is no exact equivalent in the sense implied in the title of the theme. In the end, the word challenge has been dropped. Whatever we may call them, the challenges of Canada, of course, lie in its resources and in its distances, and the exhibits will show the effects of technology on agriculture, forestry, fishing, mining, transportation, and communications.

The entire approach will be on an adult level (while you enjoy the exhibits, the children can wait in the nursery school and playgrounds which will be part of the pavilion), and exhibits will have a minimum of explanation. Rather the designers have tried to plan the layout so that visitors will have ample opportunity to absorb what they see and reflect upon it. Nonetheless, officials of the pavilion modestly told me that they would prefer that when scientists come to visit, the physicists should go to see the geology exhibit, the geologists should see the forestry, and the foresters should study the section on nuclear energy. Yet I think that no one—not even the physicists—should miss the nuclear energy exhibit, because, if there were to be a prize for the most light-hearted presentation of a scientific subject, this would be the winner. Its core is a large model of a crystal of uranium oxide made mostly of acrylic rod and sheet and containing all manner of flashing lights. The flashing lights are not meant to demonstrate real processes but rather to symbolize steps in the production of electricity. Above it all is a delightful ceiling, decorated by the Montreal cartoonist Normand Hudon. This ceiling is intended to represent, in terms of sheerest fantasy, the nature of the principal sources of renewable energy—the sun, the wind, the tides. Perhaps it does so, but not really obviously, and it takes a bit of study. The longer one studies this ceiling, the more one finds in it, and each discovery is more amusing than the last.

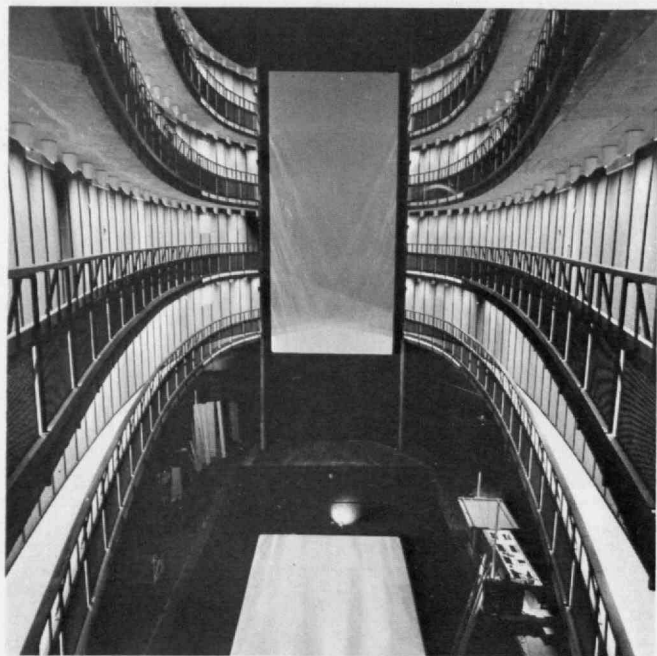
The final section of the Canadian Pavilion, an exhibit called "Changing Times," will bring the visitor sharply back to reality. Like the end of "Man in Control?" this exhibit may even disturb the visitor, for it will ask *him* to answer questions and to make choices, some based on knowledge and some on his own notion of morality. The intention—and I hope it is fulfilled—is to drive home the point that people who learn have a better chance to make wise choices.

The World on Film

This willingness to challenge visitors—I want to make a clear distinction here between challenging to evoke reflection and merely shocking to provoke titillation—is clearly impressive, just as the strict adherence to the theme is impressive. The discipline of Expo extends to the industrial pavilions, which will have no advertising handouts and no giveaways. As W. A. Howard, manager of the Canadian National Railways Pavilion told me, giveaways would only mean that the grounds around each building would quickly be covered with litter.



Deep-sea oceanographic vessels receive a coat of paint prior to installation in the theme pavilion "Man the Explorer." Implicit in such exhibits is the message that the modern explorer is a scientist.



The Labyrinth, a complex of theaters, will feature spectacular film presentations to summarize Expo's entire theme. The photograph shows the first theater, in which visitors will encounter film on horizontal and vertical screens.

The "hard sell" is also taboo, for the management of Expo exercised strict control over the material presented and laid down the rule that "anything you do with your product must be educational and entertaining."

Yet there was one guideline that was obviously disregarded. The following was its official wording (in the same "lecture" from which I quoted earlier): "People are no longer awed by the latest model of widescreen cinema . . ." But looking around at what is being done, one might conclude that the planners have the notion that no one in this modern world can be entertained at all unless he is watching flickering images on a screen.

Even in the Theme Pavilions, some 80 per cent of the material, I have been told, will be on film. "Man and the Polar Regions" will have a "carousel" theater, and the most spectacular film presentation of all will be in the "Labyrinth," a multi-theater building, which is part of the theme complex. There the National Film Board of Canada will exhibit special material to summarize the entire theme. In the first theater, on both horizontal and vertical screens, the visitor will witness "The Birth of the Hero and his Entry into the World." He will then be ushered through a labyrinth of mirrors to a second theater where he will see "Daedalus," the hero moving step by step through adolescence. Finally, in a third theater with five panoramic screens laid out in the form of a cross, he will observe the hero through the period of "the awakening of individual awareness" up to adulthood.

The National Film Board of Canada has earned worldwide respect for its skill in making documentary films. Although I haven't seen the final product, I think I can safely urge all visitors to Expo to see the "Labyrinth." It will surely be thought-provoking, and it will also be fun.

I would be the last to deny that a fair which must attract 30 million or more visits from over 10 million visitors must have showmanship and spectacle and must offer plenty of fun. I am happy to see that some pavilions, however serious their basic purpose, are even emphasizing the fun part. The Canadian Pulp and Paper Association, for example, has frankly called its principal exhibit "Fun in the Forest," and in a show using all the techniques of theater—live actors, puppets, exhibits, film—will try to demonstrate how the industry is involved in the everyday life of modern man and how it may contribute to the well-being of his descendants.

The Telephone Association of Canada (representing both private and government-owned companies) also aims, in the words of the manager of its pavilion, "to supply a happy experience for visitors." The exhibits, though founded on the "science of telephony" and other aspects of communication, are not expected or designed to attract the attention of more than 40 per cent of the people who visit the pavilion for the main feature, which will be a film, "Canada '67," presented on Disney's "Circle-Vision 360°"—a screen 23 feet high and 273 feet in circumference, completely surrounding the audience. I haven't seen the film itself, but I have been told by some who have that the effect is more intense than

Cinerama and that the producers have been forced to tone down or eliminate parts (airplane rides and roller coasters) that might upset members of the audience with sensitive stomachs.

In another two-part pavilion, notable for its effort to convey the difficult notion of the operation of our five senses, CPR-Cominco (Canadian Pacific Railways and its subsidiary the Consolidated Mining and Smelting Company) will offer a multiscreen presentation that they, too, consider, a winner.

In short, every conceivable gimmick and gadget will be used: wide screens, tall screens, multiple screens, curved screens, horizontal screens. In addition to those I have mentioned nearly every major national and industrial pavilion includes at least a theater, with some, as in the Canadian Pavilion, where the audience is moved bodily on a carousel from one theater to another. It will be a relief to come upon the film on motion which is to be shown in the pavilion of the Canadian National Railways: the screen will be just a plain rectangle, with no gimmicks. The United States Pavilion may be even more refreshing, for there the use of film will be kept to a minimum ("This is not a film festival," one of the officials told me; "a fair is a place where one shows things.") Best of all may be the Air Canada Pavilion; it has no film at all.

I do not doubt that all these films will be magnificent, but I do wonder at what seems to me to be an over-reliance on film to tell the story. A movie, after all, is the kind of thing people can see anywhere (although admittedly not on round screens, multiple screens, cruciform screens, and the rest). Why in the world would anyone want to travel thousands or even hundreds of miles just to see movies, when he can see all he wants in his own home town?

As I thought about this, my own answer took the form that it wasn't so much that many people wanted to see movies as that a few people wanted to make them. I formed a whole elaborate hypothesis that the young intellectuals of today are turning away from the writing of books to the making of films. Every campus has its would-be Fellini; nobody wants to be a Hemingway any more. They have traded their Underwoods for Bolexes. So why be surprised if a world's fair shows the influence of the Bolex Generation?

It is a good theory, worthy of a sociologist (which I am *not*); but the truth, as I have found out, may be much simpler: the most popular exhibits at the last world's fair in New York were the films, and all we are witnessing in Montreal is an expansion of the trend.

We will also, I believe, see one significant improvement. Expo will have a preticketing system that will enable visitors to select their shows days or at least hours in advance, and they will thus avoid having to stand in line for four hours to see a 20-minute film.

I think that in all fairness I must also mention that a considerable number of scientific films will be available at Expo. Some of the theaters in the national pavilions, especially the West German, the Soviet, and the French, will be among the places where such films, among others,

will be shown. In addition, there will be a program of scientific films nearly every afternoon in the Du Pont of Canada Auditorium.

The Lectures, The Concerts, and Art

The Du Pont of Canada Auditorium will also serve as a site for meetings of national and international scientific and scholarly societies. Besides, every Monday night during Expo an invited audience will hear lectures delivered by world-renowned scholars, scientists and writers. (There are already waiting lists for many of the lectures, but those who may happen to be planning a visit which will include a Monday evening may be able to pick up cancellations by writing well in advance to Mr. D. Hunka, Theme Branch, Expo '67, Montreal.) The series has been sponsored by Noranda Mines, Ltd. For Saturday mornings, the Chemical Institute of Canada has arranged, under the sponsorship of the National Research Council of Canada, a series of lectures on science for high school students.

In addition to lectures, Expo will bring more undiluted international culture than has ever before been seen in one small area of North America for such a long period of time. I have already mentioned the Fine Arts Exhibit to be shown in "Man the Creator." The collection of painting and sculpture to be brought to Expo from all parts of the world will surely be such that few people could otherwise see it in a lifetime, for to do so they would have to visit nearly every major museum in Europe and America.

They would have to do the same to hear all the music and see all the theater that will be offered both at Expo and in the concert halls of Montreal itself. The World Festival of Expo '67 will run a full six months and will offer the Concertgebouw Orchestra of Amsterdam, La Scala Opera (its first visit to North America), the Bolshoi Opera, the National Theatre of Great Britain, the Kabuki Theatre of Japan, and many other concerts, plays, and recitals.

For those who want neither edification nor culture, Expo will offer its amusement area, La Ronde, with cabarets, night clubs, a dolphin pool, and amusement park rides—a combination, they say, of Disneyland and the Tivoli Gardens, with the whole greater than the sum of its parts. Even here, one will not be able to escape technology: the biggest ride is a new invention called the Gyrotron, touted as a technological marvel.

Of course, at the time I write all this, I have not seen anything of Expo itself except the bare buildings. What I have learned, I found out by talking with the people who work there. I cannot really judge Expo, but I can only say that while I started out prepared to scoff, I have ended by being eager to praise.

Expo '67, the universal and international exhibition, must be universal in the sense that it must have something in it for everyone, and I think it will achieve this end. In biological terms, Expo will either be a whale of a success or the biggest turkey since the first Thanksgiving. Whichever it is, it will be worth traveling even thousands of miles to see. ■

What Framework for Diversity?

One critic calls Expo '67 a "disparate miscellany"; another calls it "the best designed world's fair ever staged"

By its very nature, a world's fair is at once a testing place and an exhibition ground for architects and planners. Its size and its site combine to make Expo '67, the 1967 universal and international exhibition in Montreal, important for both these functions. And it has special importance because architects and planners have had a central role in the preparations essentially since the very beginning.

The fair is built on three islands in the St. Lawrence River opposite the city of Montreal, a site which Peter Collins, Professor of Architecture at McGill University, calls "indescribably magnificent, one of the most beautiful settings in North America."

On this 1,000-acre site have been built 300 structures, according to an over-all plan which *Architectural Record* describes: "The design of the fair is based on a hierarchy of ideas: the transportation system forms the backbone of the plan; the major pavilions are focal points of areas defined by the transport system; design of street furniture, lighting and graphics further reinforces the intent of the comprehensive plan; and the whole is given a single essential character (yet no sense of uniformity)"

In devising the design restrictions, the management by design restrictions on individual exhibitors." of Expo '67 took special pains to seek reasonable and sensitive compromise between too much and too little regulation over the individual architects who would design the national and commercial pavilions. "Commercial advertisement has no place in a world exposition," Rudolf Papanek of Expo's architectural staff says. "Care had to be taken to allow sufficient architectural expression so that the best was not suppressed with the worst, and the whole thereby made mediocre, sterile, and boring."

The "ground rules" for architects appear in Expo '67's "design intent":

"It is supposed that architects selected to design national and private pavilions will have great ability and ought not to be restricted by rules which could inhibit their imaginative and spontaneous perception; nevertheless, a total harmonious effect must be achieved. . . . Architects of adjoining pavilions should explore how their buildings can be adjusted to obtain approaches in desirable ways. . . . As practically all of the buildings in the exhibition are to be temporary, probably constructed of light, prefabricated materials, it is believed that they . . . might well have a light and nonpermanent character. Architects are therefore asked to . . . explore the decorative possibilities of web or film-like materials stretched over bold frames, or the frank assembly of mass-produced components fastened together in patternful ways."

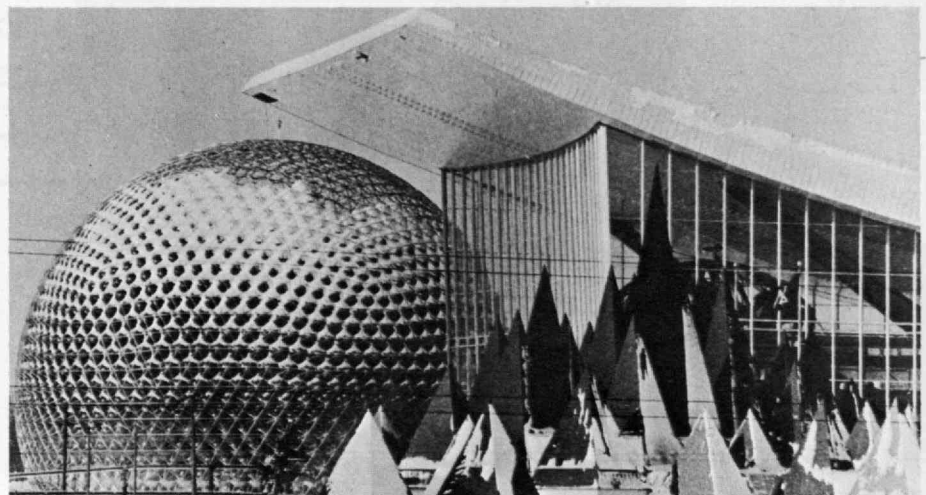
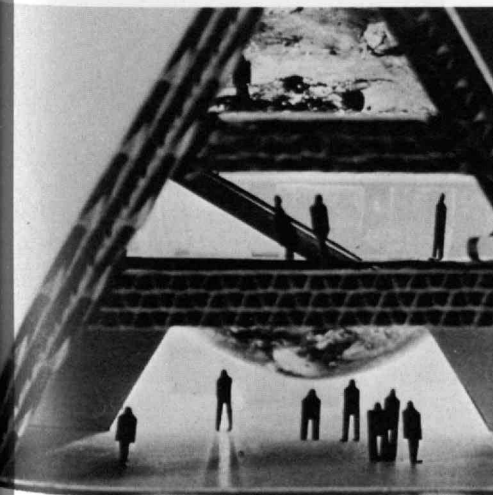
Not more than 60 per cent of each exhibitor's space was to be used for a pavilion, leaving 40 per cent for landscaping. It was in the area of landscaping—





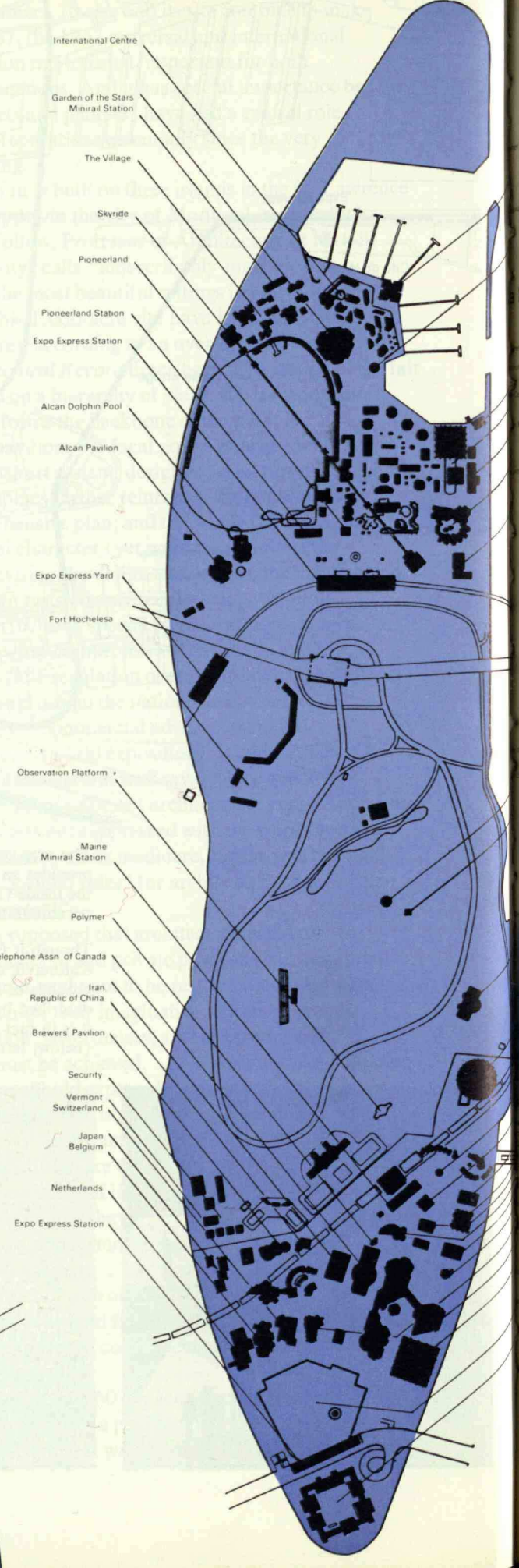
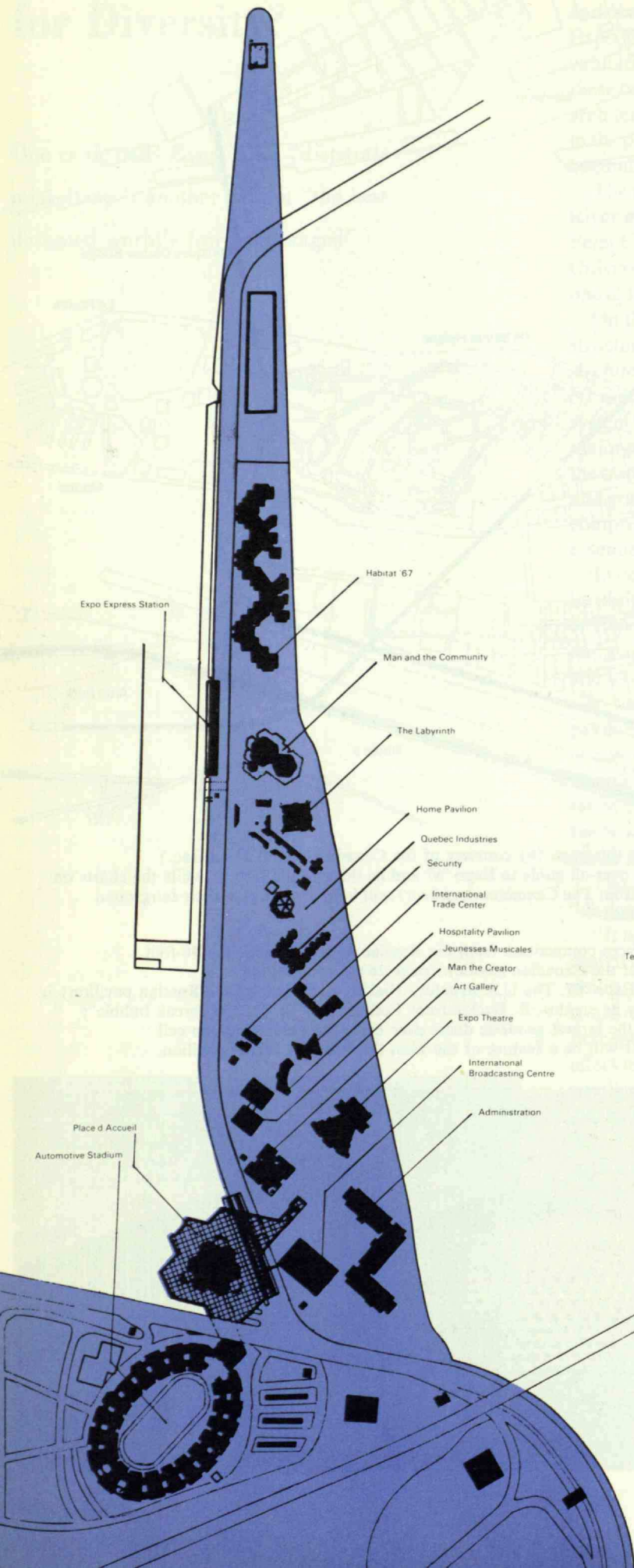
The map on this page (by courtesy of the Canada General Fund, Inc.) provides an over-all guide to Expo '67 and its three-island setting, while the charts on the inside (from *The Canadian Architect*) will help readers plan their fairground perambulations.

Though it faces competition from the Russian and U.S. halls, the 96-foot Katimavik of the Canadian pavilion (page 26) dominates the grounds of Expo '67. The U.S. structure (below, right, behind the Russian pavilion) is described by its creator, R. Buckminster Fuller, as a "geodesic skybreak bubble"; it is in fact the largest geodesic dome ever built. An outsize human cell (below, left) will be a feature of the Man the Provider theme pavilion.



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Ile Notre Dame

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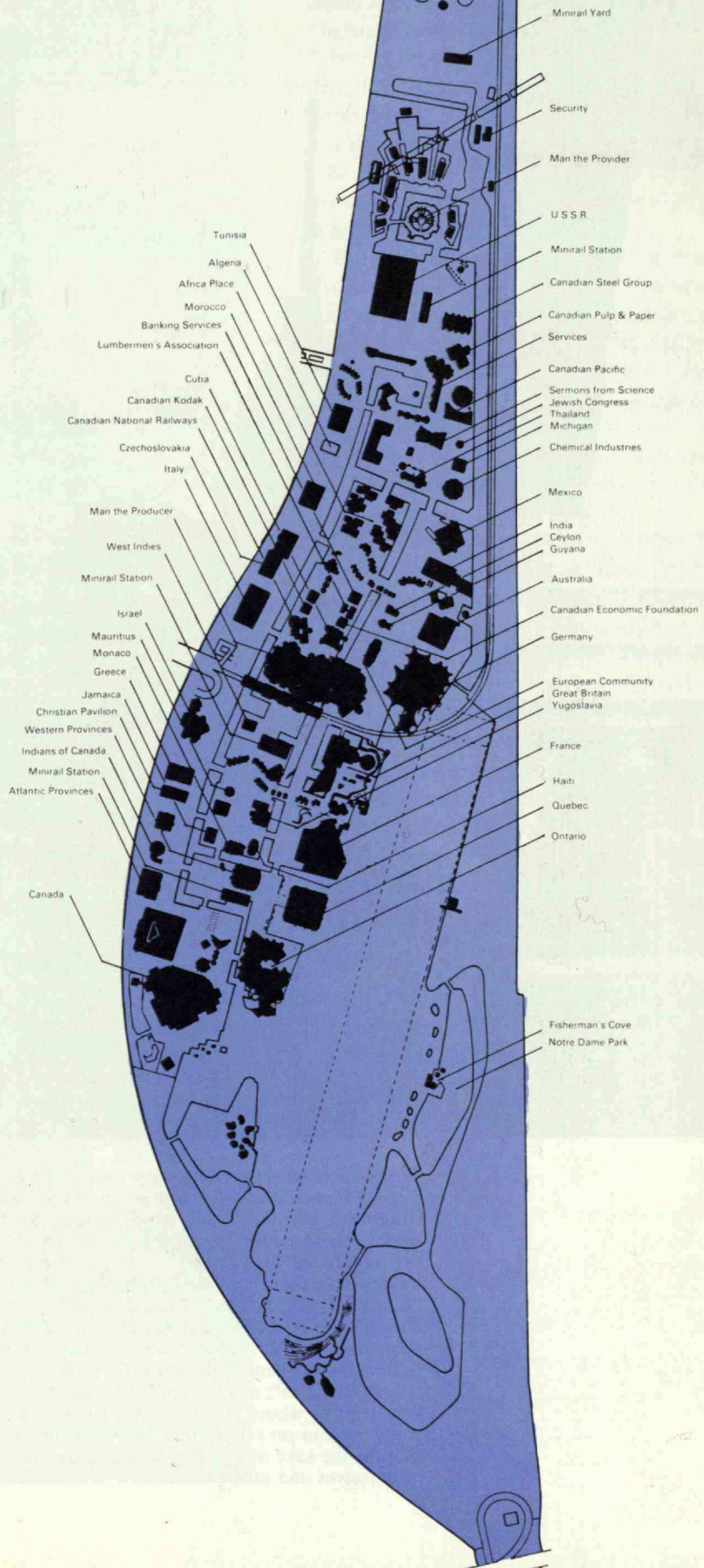
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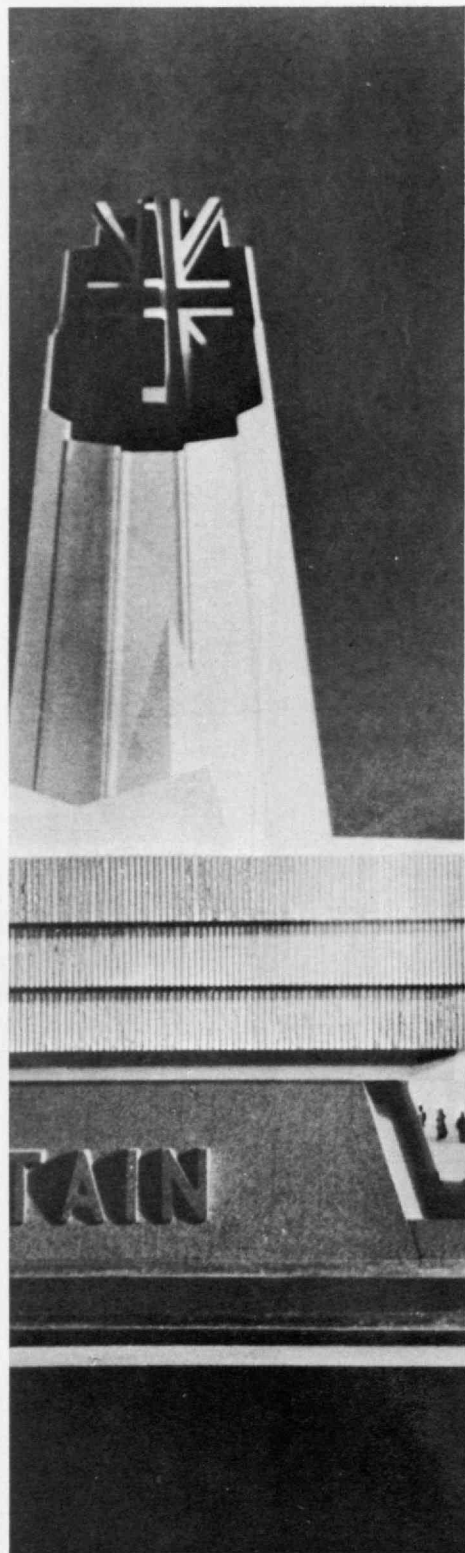
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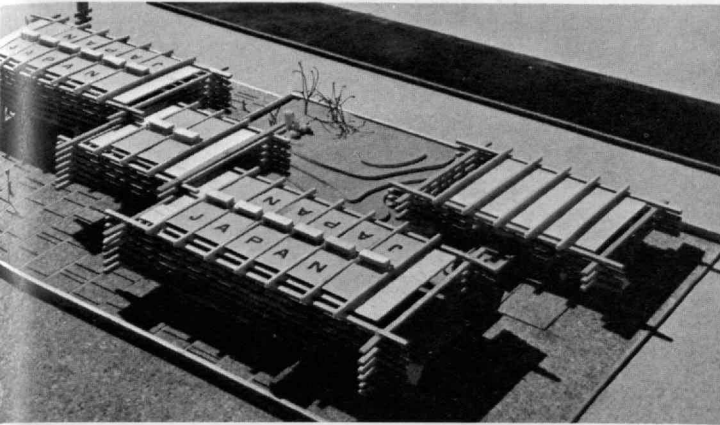
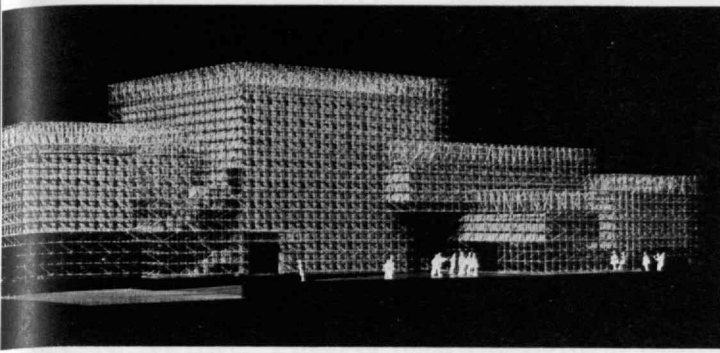
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The pictures on these pages show some of Expo '67's architectural features: the tower of the British pavilion (left), which remains apparently incomplete to symbolize that Man's progress is ever unfinished; the unique German pavilion (above), under whose tent roof "the light quality varies beautifully with the time of day and outdoor conditions"; the Netherlands (top right) and Japanese pavilions, praised for their "rational approaches to the vast problems of designing for an international exhibition"; and the La Ronde amusement area (right), whose architect says, "In amusement parks you can get rid of inhibitions—just be silly for the sake of silliness. They are caricatures of ourselves and of architecture."



and in lighting and the control of signs—that Expo '67 exercised maximum influence “to create environmental harmony even under the circumstances of architectural diversity,” according to Mr. Papanek.

The result is that “architectural styles run a full gamut from airy, lightweight frames to sleek, glassy boxes, from mounds of earth to slabs of steel.” “In fact,” writes Lynn Sherr in *Art in America*, “about all these structures have in common is their diversity—diversity within the framework of Expo itself.”

Edouard Fiset, chief architect of Expo '67, thinks that “the example of co-ordinating and harmonizing all the diverse elements on the site” will be Expo's lasting contribution.

But the effort has not met with universal approval. Professor Collins, writing in *The Canadian Architect*, says that many aspects of the architectural environment suggest to him “a preponderant influence of the more sordid kinds of commercial interest”; the buildings, he says, suggest a “disparate miscellany.”

“It seems to me that the authorities eventually accepted a solution which erred in being too accommodating, especially to those who consider self-advertisement the characteristic virtue of courage,” Professor Collins wrote. “If Canada really had wanted to give a lead in planning its celebration of Canadian unity, it might profitably have empowered the chief architect of Expo '67 to impose complete co-ordination in the design of each pavilion and, consequently, in the detailed design of the spaces and relationships between them.”

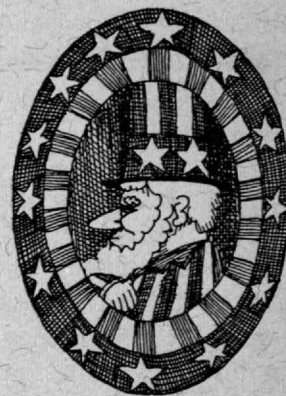
If there is diversity among their buildings, so is there among architects as critics. Karl Schwanzer of Vienna, the designer of the Austrian pavilion, is quoted as saying that Expo has “the most exciting collection of buildings I have ever seen.” And David Wainwright, writing in *Design* magazine, says “Expo '67 promises to be the best designed world's fair ever staged.” Through the mediums of its design as well as its exhibits, the fair proposes that its visitors leave “with a feeling of the unity of mankind,” in the words of Ambassador Pierre Dupuy, Commissioner General of Expo '67, who spoke at M.I.T. during the winter. ■

*On the next 40 pages, Technology Review
presents a special supplement on the
growing involvement of the Federal government
in American education and science, and in M.I.T.*



*America's colleges and universities,
recipients of billions in Federal funds,
have a new relationship:*

Life with Uncle



WHAT WOULD HAPPEN if all the Federal dollars now going to America's colleges and universities were suddenly withdrawn?

The president of one university pondered the question briefly, then replied: "Well, first, there would be this very loud sucking sound."

Indeed there would. It would be heard from Berkeley's gates to Harvard's yard, from Colby, Maine, to Kilgore, Texas. And in its wake would come shock waves that would rock the entire establishment of American higher education.

No institution of higher learning, regardless of its size or remoteness from Washington, can escape the impact of the Federal government's involvement in higher education. Of the 2,200 institutions of higher learning in the United States, about 1,800 participate in one or more Federally supported or sponsored programs. (Even an institution which receives no Federal dollars is affected—for it must compete for faculty, students, and private dollars with the institutions that do receive Federal funds for such things.)

Hence, although hardly anyone seriously believes that Federal spending on the campus is going to stop or even decrease significantly, the possibility, however remote, is enough to send shivers down the nation's academic backbone. Colleges and universities operate on such tight budgets that even a relatively slight ebb in the flow of Federal funds could be serious. The fiscal belt-tightening in Washington, caused by the war in Vietnam and the threat of inflation, has already brought a financial squeeze to some institutions.

A look at what would happen if all Federal dollars were suddenly withdrawn from colleges and universities may be an exercise in the absurd, but it dramatizes the depth of government involvement:

► The nation's undergraduates would lose more than 800,000 scholarships, loans, and work-study grants, amounting to well over \$300 million.

► Colleges and universities would lose some \$2 billion which now supports research on the campuses. Consequently some 50 per cent of America's science faculty members would be without support for their research. They would lose the summer salaries which they have come to depend on—and, in some cases, they would lose part of their salaries for the other nine months, as well.

► The big government-owned research laboratories which several universities operate under contract would be closed. Although this might end some management headaches for the universities, it would also deprive thousands of scientists and engineers of employment and the institutions of several million dollars in overhead reimbursements and fees.

► The newly established National Foundation for the Arts and Humanities—for which faculties have waited for years—would collapse before its first grants were spent.

► Planned or partially constructed college and university buildings, costing roughly \$2.5 billion, would be delayed or abandoned altogether.

► Many of our most eminent universities and medical schools would find their annual budgets sharply reduced—in some cases by more than 50 per cent. And the 68 land-grant institutions would lose Fed-

A partnership of brains, money, and mutual need

eral institutional support which they have been receiving since the nineteenth century.

► Major parts of the anti-poverty program, the new GI Bill, the Peace Corps, and the many other programs which call for spending on the campuses would founder.

THE FEDERAL GOVERNMENT is now the "Big Spender" in the academic world. Last year, Washington spent more money on the nation's campuses than did the 50 state governments combined. The National Institutes of Health alone spent more on educational and research projects than any one state allocated for higher education. The National Science Foundation, also a Federal agency, awarded more funds to colleges and universities than did all the business corporations in America. And the U.S. Office of Education's annual expenditure in higher education of \$1.2 billion far exceeded all gifts from private foundations and alumni. The \$5 billion or so that the Federal government will spend on campuses this year constitutes more than 25 per cent of higher education's total budget.

About half of the Federal funds now going to academic institutions support research and research-related activities—and, in most cases, the research is in the sciences. Most often an individual scholar, with his institution's blessing, applies directly to a Federal agency for funds to support his work. A professor of chemistry, for example, might apply to the National Science Foundation for funds to pay for salaries (part of his own, his collaborators', and his research technicians'), equipment, graduate-student stipends, travel, and anything else he could justify as essential to his work. A panel of his scholarly peers from colleges and universities, assembled by NSF, meets periodically in Washington to evaluate his and other applications. If the panel members approve, the professor usually receives his grant and his college or university receives a percentage of the total amount to meet its overhead costs. (Under several Federal programs, the institution itself can

request funds to help construct buildings and grants to strengthen or initiate research programs.)

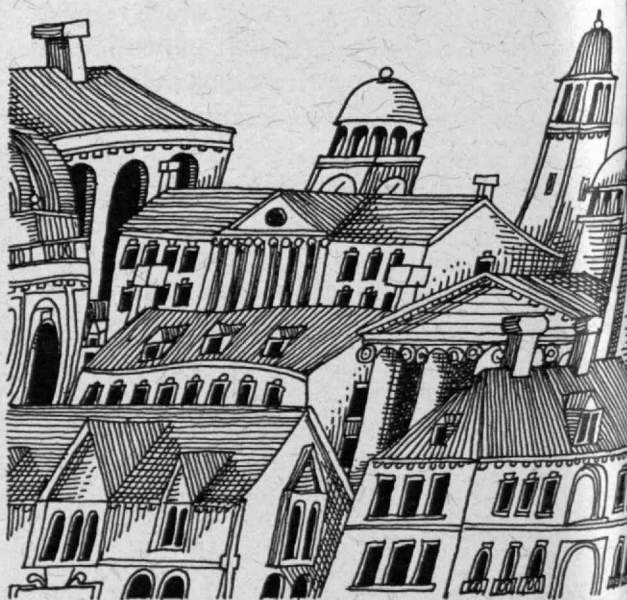
The other half of the Federal government's expenditure in higher education is for student aid, for books and equipment, for classroom buildings, laboratories, and dormitories, for overseas projects, and—recently, in modest amounts—for the general strengthening of the institution.

There is almost no Federal agency which does not provide some funds for higher education. And there are few activities on a campus that are not eligible for some kind of government aid.

CLEARLY our colleges and universities now depend so heavily on Federal funds to help pay for salaries, tuition, research, construction, and operating costs that any significant decline in Federal support would disrupt the whole enterprise of American higher education.

To some educators, this dependence is a threat to the integrity and independence of the colleges and universities. "It is unnerving to know that our system of higher education is highly vulnerable to the whims and fickleness of politics," says a man who has held high positions both in government and on the campus.

Others minimize the hazards. Public institutions, they point out, have always been vulnerable in this



Every institution, however small or remote, feels the effects of the Federal role in higher education.

ense—yet look how they've flourished. Congressmen, in fact, have been conscientious in their approach to Federal support of higher education; the problem is that standards other than those of the universities and colleges could become the determining factors in the nature and direction of Federal support. In any case, the argument runs, all academic institutions depend on the good will of others to provide the support that insures freedom. McGeorge Bundy, before he left the White House to head the Ford Foundation, said flatly: "American higher education is more and not less free and strong because of Federal funds." Such funds, he argued, actually have enhanced freedom by enlarging the opportunity of institutions to act; they are no more tainted than are dollars from other sources; and the way in which they are allocated is closer to academic tradition than is the case with nearly all other major sources of funds.

The issue of Federal control notwithstanding, Federal support of higher education is taking its place alongside military budgets and farm subsidies as one of the government's essential activities. All evidence indicates that such is the public's will. Education has always had a special worth in this country, and each new generation sets the valuation higher. In a recent Gallup Poll on national goals, Americans listed education as having first priority. Governors, state legislators, and Congressmen, ever sensitive to voter attitudes, are finding that the improvement of education is not only a noble issue on which to stand, but a winning one.

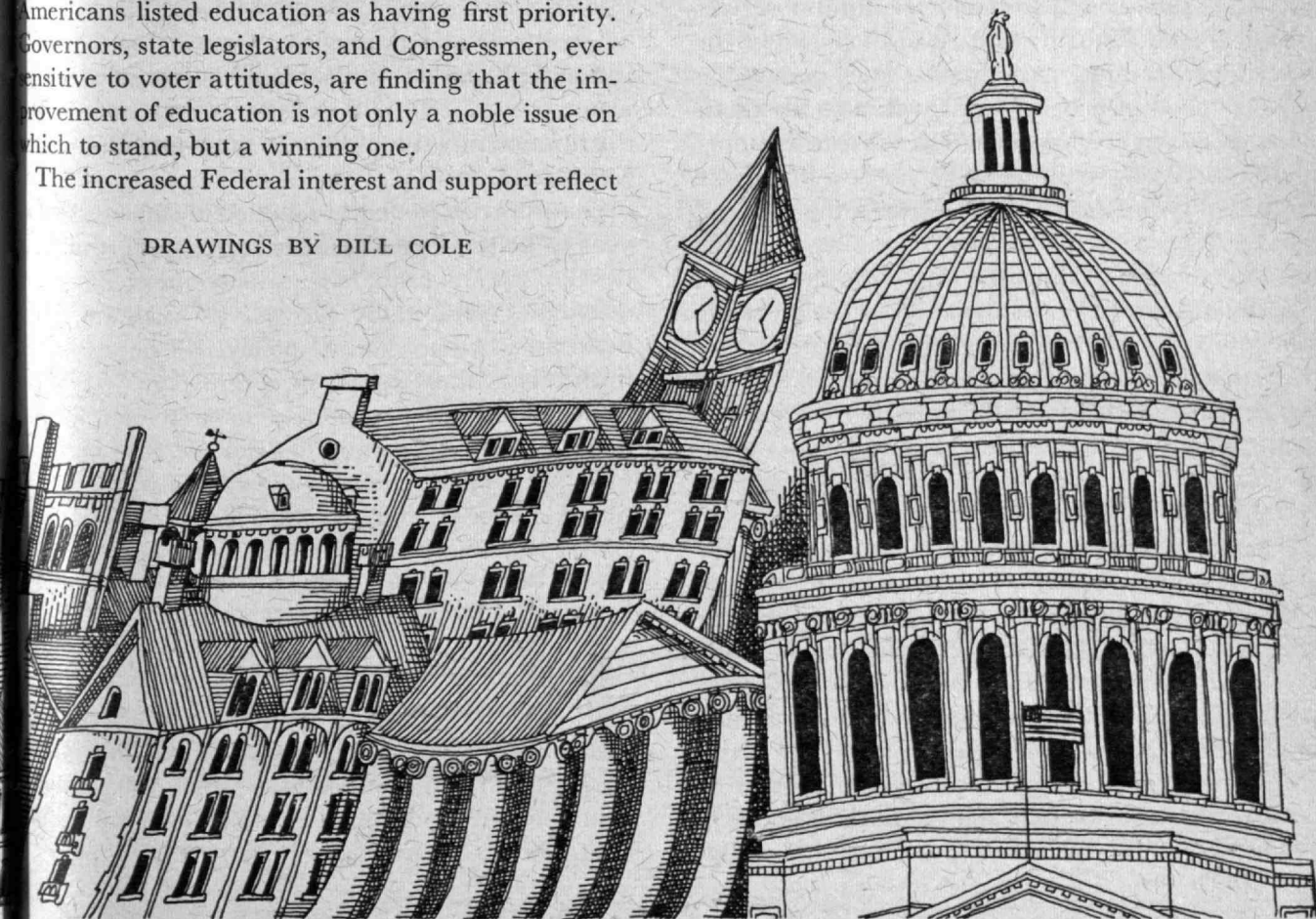
The increased Federal interest and support reflect

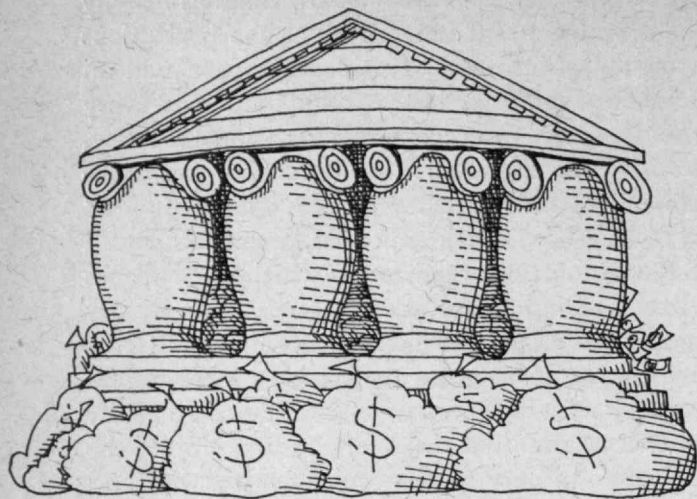
another fact: the government now relies as heavily on the colleges and universities as the institutions do on the government. President Johnson told an audience at Princeton last year that in "almost every field of concern, from economics to national security, the academic community has become a central instrument of public policy in the United States."

Logan Wilson, president of the American Council on Education (an organization which often speaks in behalf of higher education), agrees. "Our history attests to the vital role which colleges and universities have played in assuring the nation's security and progress, and our present circumstances magnify rather than diminish the role," he says. "Since the final responsibility for our collective security and welfare can reside only in the Federal government, a close partnership between government and higher education is essential."

THE PARTNERSHIP indeed exists. As a report of the American Society of Biological Chemists has said, "the condition of mutual dependence be-

DRAWINGS BY DILL COLE





The haves and have-nots

concentration of funds. When the war ended, however, the lopsided distribution of Federal research funds did not. In fact, it has continued right up to the present, with 29 institutions receiving more than 50 per cent of Federal research dollars.

To the institutions on the receiving end, the situation seems natural and proper. They are, after all, the strongest and most productive research centers in the nation. The government, they argue, has an obligation to spend the public's money where it will yield the highest return to the nation.

The less-favored institutions recognize this obligation, too. But they maintain that it is equally important to the nation to develop new institutions of high quality—yet, without financial help from Washington, the second- and third-rank institutions will remain just that.

In late 1965 President Johnson, in a memorandum to the heads of Federal departments and agencies, acknowledged the importance of maintaining scientific excellence in the institutions where it now exists. But, he emphasized, Federal research funds should also be used to strengthen and develop new centers of excellence. Last year this "spread the wealth" movement gained momentum, as a number of agencies stepped up their efforts to broaden the distribution of research money. The Department of Defense, for example, one of the bigger purchasers of research, designated \$18 million for this academic year to help about 50 widely scattered institutions develop into high-grade research centers. But with economies induced by the war in Vietnam, it is doubtful whether enough money will be available in the near future to end the controversy.

Eventually, Congress may have to act. In so doing, it is almost certain to displease, and perhaps hurt, some institutions. To the pessimist, the situation is a sign of troubled times ahead. To the optimist, it is the democratic process at work.

RECENT STUDENT DEMONSTRATIONS have dramatized another problem to which the partnership between the government and the campus has contributed: the relative emphasis that is placed

tween the Federal government and institutions of higher learning and research is one of the most profound and significant developments of our time."

Directly and indirectly, the partnership has produced enormous benefits. It has played a central role in this country's progress in science and technology—and hence has contributed to our national security, our high standard of living, the lengthening life span, our world leadership. One analysis credits to education 40 per cent of the nation's growth in economic productivity in recent years.

Despite such benefits, some thoughtful observers are concerned about the future development of the government-campus partnership. They are asking how the flood of Federal funds will alter the traditional missions of higher education, the time-honored responsibility of the states, and the flow of private funds to the campuses. They wonder if the give and take between equal partners can continue, when one has the money and the other "only the brains."

Problems already have arisen from the dynamic and complex relationship between Washington and the academic world. How serious and complex such problems can become is illustrated by the current controversy over the concentration of Federal research funds on relatively few campuses and in certain sections of the country.

The problem grew out of World War II, when the government turned to the campuses for desperately needed scientific research. Since many of the best-known and most productive scientists were working in a dozen or so institutions in the Northeast and a few in the Midwest and California, more than half of the Federal research funds were spent there. (Most of the remaining money went to another 50 universities with research and graduate training.)

The wartime emergency obviously justified this

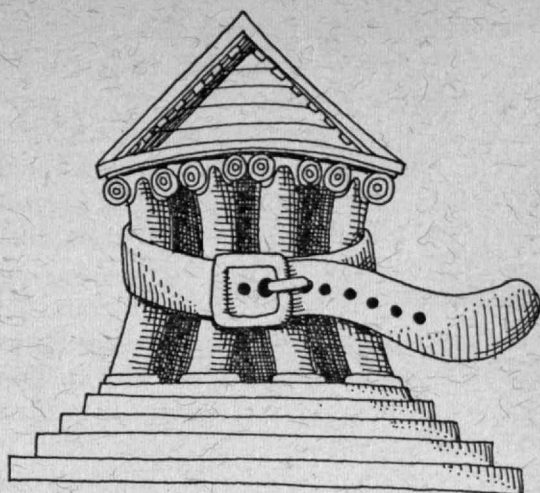
mpete for limited funds

on research and on the teaching of undergraduates. Wisconsin's Representative Henry Reuss conducted a Congressional study of the situation. Subsequently he said: "University teaching has become sort of poor relation to research. I don't quarrel with the goal of excellence in science, but it is pursued at the expense of another important goal—excellence of teaching. Teaching suffers and is going to suffer more."

The problem is not limited to universities. It is having a pronounced effect on the smaller liberal arts colleges, the women's colleges, and the junior colleges—all of which have as their primary function the teaching of undergraduates. To offer a first-rate education, the colleges must attract and retain first-rate faculty, which in turn attracts good students and financial support. But undergraduate colleges can rarely compete with Federally supported universities in faculty salaries, fellowship awards, research opportunities, and plant and equipment. The president of one of the best undergraduate colleges says: "When we do get a young scholar who skillfully combines research and teaching abilities, the universities lure him from us with the promise of a high salary, light teaching duties, frequent leaves, and almost anything else he may want."

Leland Haworth, whose National Science Foundation distributes more than \$300 million annually for research activities and graduate programs on the campuses, disagrees. "I hold little or no brief," he says, "for the allegation that Federal support of research has detracted seriously from undergraduate teaching. I dispute the contention heard in some quarters that certain of our major universities have become giant research factories concentrating on federally sponsored research projects to the detriment of their educational functions." Most university scholars would probably support Mr. Haworth's contention that teachers who conduct research are generally better teachers, and that the research enterprise has infused science education with new substance and vitality.

To get perspective on the problem, compare university research today with what it was before World War II. A prominent physicist calls the pre-war days "a horse-and-buggy period." In 1930, colleges and universities spent less than \$20 million on scientific research, and that came largely from pri-



vate foundations, corporations, and endowment income. Scholars often built their equipment from ingeniously adapted scraps and spare machine parts. Graduate students considered it compensation enough just to be allowed to participate.

Some three decades and \$125 billion later, there is hardly an academic scientist who does not feel pressure to get government funds. The chairman of one leading biology department admits that "if a young scholar doesn't have a grant when he comes here, he had better get one within a year or so or he's out; we have no funds to support his research."

Considering the large amounts of money available for research and graduate training, and recognizing that the publication of research findings is still the primary criterion for academic promotion, it is not surprising that the faculties of most universities spend a substantial part of their energies in those activities.

Federal agencies are looking for ways to ease the problem. The National Science Foundation, for example, has set up a new program which will make grants to undergraduate colleges for the improvement of science instruction.

More help will surely be forthcoming.

THE FACT that Federal funds have been concentrated in the sciences has also had a pronounced effect on colleges and universities. In many institutions, faculty members in the natural sciences earn more than faculty members in the humanities and social sciences; they have better facilities, more frequent leaves, and generally more influence on the campus.

The government's support of science can also disrupt the academic balance and internal priorities of a college or university. One president explained:

"Our highest-priority construction project was a \$3 million building for our humanities departments. Under the Higher Education Facilities Act, we could expect to get a third of this from the Federal government. This would leave \$2 million for us to get from private sources.

"But then, under a new government program, the biology and psychology faculty decided to apply to the National Institutes of Health for \$1.5 million for new faculty members over a period of five years. These additional faculty people, however, made it necessary for us to go ahead immediately with our plans for a \$4 million science building—so we gave *it* the No. 1 priority and moved the humanities building down the list.

"We could finance half the science building's cost with Federal funds. In addition, the scientists pointed out, they could get several training grants which would provide stipends to graduate students and tuition to our institution.

"You see what this meant? Both needs were valid—those of the humanities and those of the sciences. For \$2 million of private money, I could either build a \$3 million humanities building *or* I could build a \$4 million science building, get \$1.5 million for additional faculty, and pick up a few hundred thousand dollars in training grants. Either-or; not both."

The president could have added that if the scientists had been denied the privilege of applying to NIH, they might well have gone to another institution, taking their research grants with them. On the other hand, under the conditions of the academic marketplace, it was unlikely that the humanities scholars would be able to exercise a similar mobility.

The case also illustrates why academic administrators sometimes complain that Federal support of an individual faculty member's research projects casts their institution in the ineffectual role of a legal middleman, prompting the faculty member to feel a greater loyalty to a Federal agency than to the college or university.

Congress has moved to lessen the disparity between support of the humanities and social sciences on the one hand and support of the physical and biological sciences on the other. It established the National Foundation for the Arts and Humanities—a move which, despite a pitifully small first-year allocation of funds, offers some encouragement. And close observers of the Washington scene predict that

The affluence of research

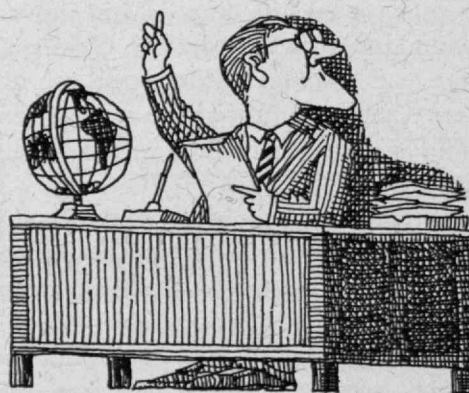
the social sciences, which have been receiving some Federal support, are destined to get considerably more in the next few years.

EFFORTS TO COPE with such difficult problems must begin with an understanding of the nature and background of the government-campus partnership. But this presents a problem in itself, for one encounters a welter of conflicting statistics, contradictory information, and wide differences of honest opinion. The task is further complicated by the swiftness with which the situation continually changes. And—the ultimate complication—there is almost no uniformity or coordination in the Federal government's numerous programs affecting higher education.

Each of the 50 or so agencies dispensing Federal funds to the colleges and universities is responsible for its own program, and no single Federal agency supervises the entire enterprise. (The creation of the Office of Science and Technology in 1962 represented an attempt to cope with the multiplicity of relationships. But so far there has been little significant improvement.) Even within the two houses of Congress, responsibility for the government's expenditures on the campuses is scattered among several committees.

Not only does the lack of a coordinated Federal program make it difficult to find a clear definition of the government's role in higher education, but it also creates a number of problems both in Washington and on the campuses.

The Bureau of the Budget, for example, has had to



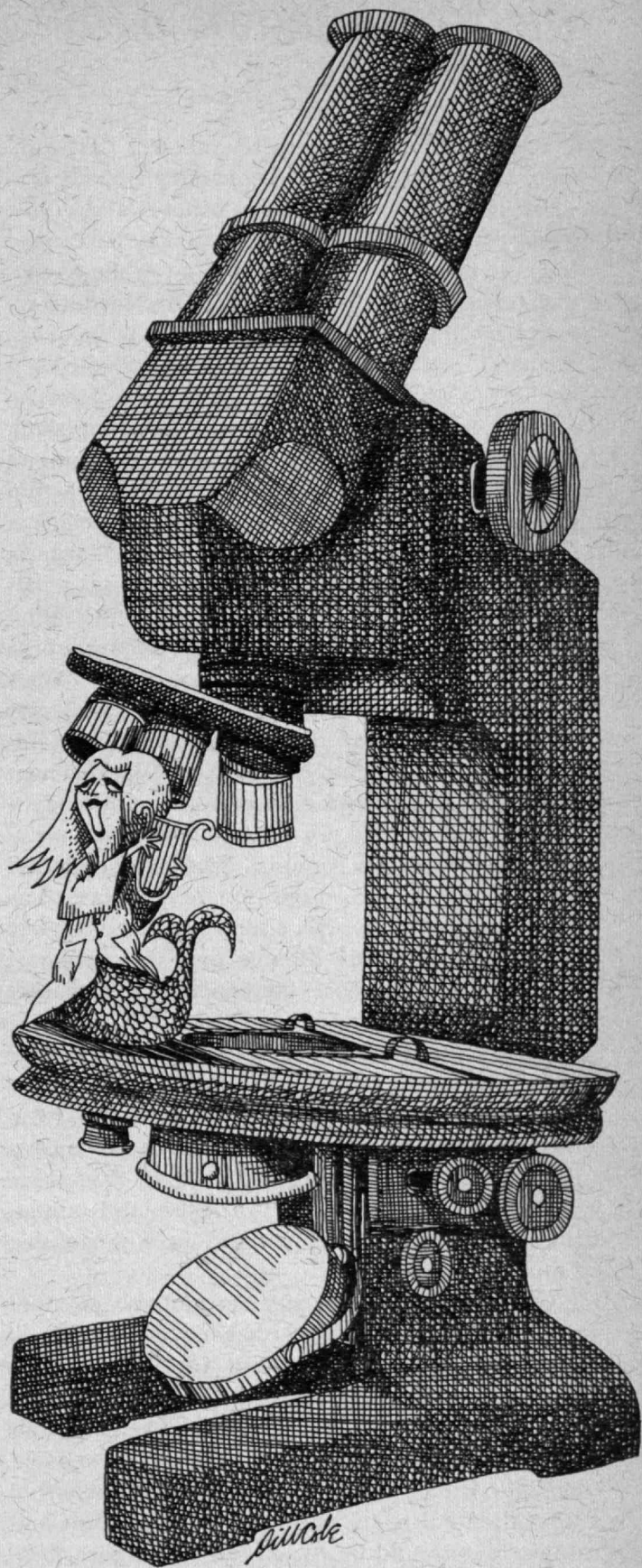
siren song to teachers

wrestle with several uncoordinated, duplicative Federal science budgets and with different accounting systems. Congress, faced with the almost impossible task of keeping informed about the esoteric world of science in order to legislate intelligently, finds it difficult to control and direct the fast-growing Federal investment in higher education. And the individual government agencies are forced to make policy decisions and to respond to political and other pressures without adequate or consistent guidelines from above.

The colleges and universities, on the other hand, must negotiate the maze of Federal bureaus with consummate skill if they are to get their share of the Federal largesse. If they succeed, they must then cope with mountains of paperwork, disparate systems of accounting, and volumes of regulations that differ from agency to agency. Considering the magnitude of the financial rewards at stake, the institutions have had no choice but to enlarge their administrative staffs accordingly, adding people who can handle the business problems, wrestle with paperwork, manage grants and contracts, and untangle legal snarls. College and university presidents are constantly looking for competent academic administrators to prowling the Federal agencies in search of programs and opportunities in which their institutions can profitably participate.

The latter group of people, whom the press calls "university lobbyists," has been growing in number. At least a dozen institutions now have full-time representatives working in Washington. Many more have members of their administrative and academic staffs shuttling to and from the capital to negotiate Federal grants and contracts, cultivate agency personnel, and try to influence legislation. Still other institutions have enlisted the aid of qualified alumni or trustees who happen to live in Washington.

THE LACK of a uniform Federal policy prevents the clear statement of national goals that might give direction to the government's investments in higher education. This takes a toll in effectiveness and consistency and tends to produce contradictions and conflicts. The teaching-versus-research controversy is one example.



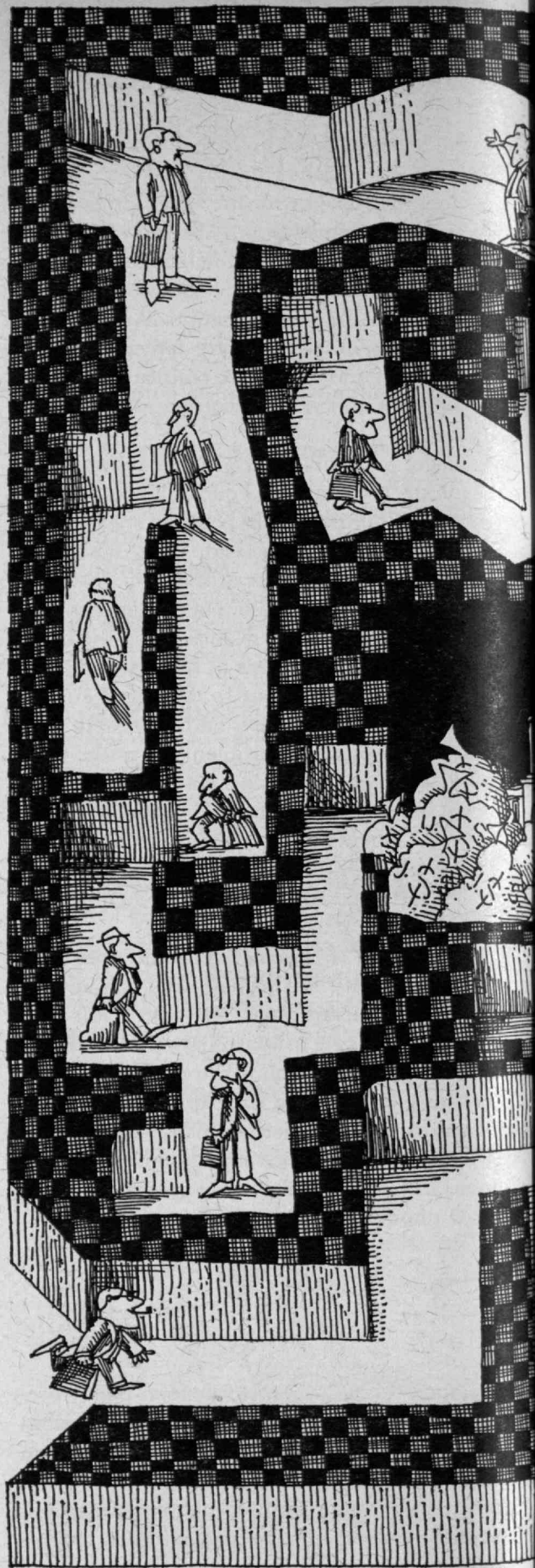
Fund-raisers prowl the Washington maze

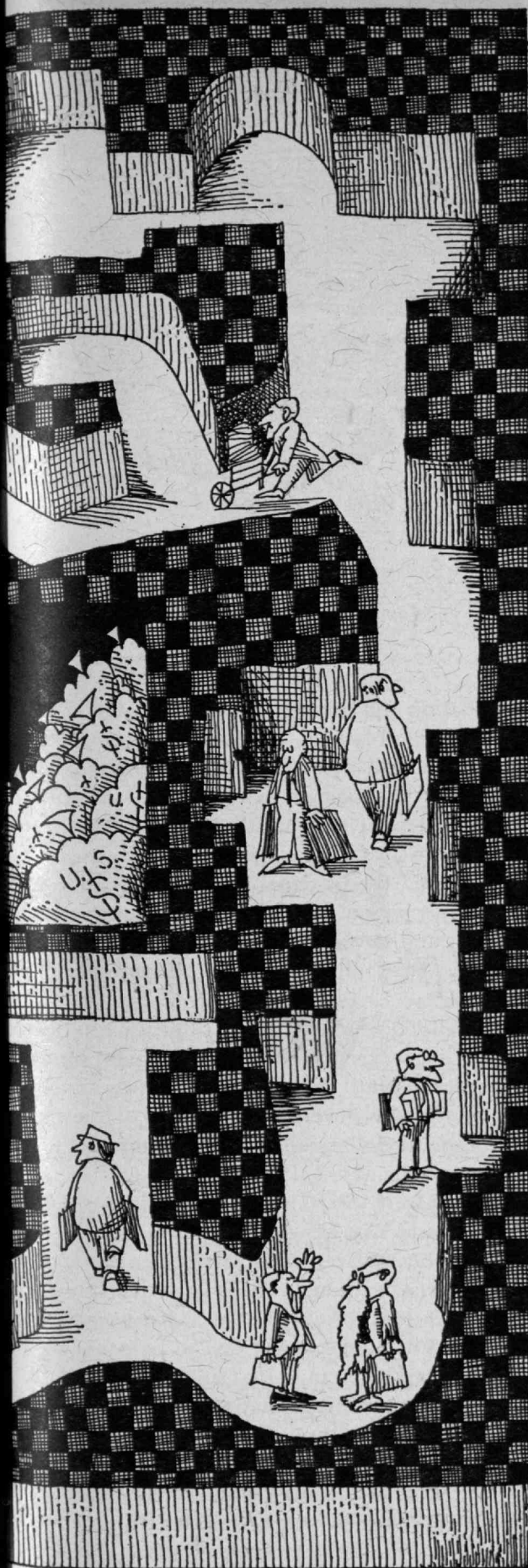
President Johnson provided another. Last summer, he publicly asked if the country is really getting its money's worth from its support of scientific research. He implied that the time may have come to apply more widely, for the benefit of the nation, the knowledge that Federally sponsored medical research had produced in recent years. A wave of apprehension spread through the medical schools when the President's remarks were reported. The inference to be drawn was that the Federal funds supporting the elaborate research effort, built at the urging of the government, might now be diverted to actual medical care and treatment. Later the Secretary of Health, Education, and Welfare, John W. Gardner, tried to lay a calming hand on the medical scientists' fevered brows by making a strong reaffirmation of the National Institutes of Health's commitment to basic research. But the apprehensiveness remains.

Other events suggest that the 25-year honeymoon of science and the government may be ending. Connecticut's Congressman Emilio Q. Daddario, a man who is not intimidated by the mystique of modern science, has stepped up his campaign to have a greater part of the National Science Foundation budget spent on applied research. And, despite pleas from scientists and NSF administrators, Congress terminated the costly Mohole project, which was designed to gain more fundamental information about the internal structure of the earth.

Some observers feel that because it permits and often causes such conflicts, the diversity in the government's support of higher education is a basic flaw in the partnership. Others, however, believe this diversity, despite its disadvantages, guarantees a margin of independence to colleges and universities that would be jeopardized in a monolithic "super-bureau."

Good or bad, the diversity was probably essential to the development of the partnership between Washington and the academic world. Charles Kidd, executive secretary of the Federal Council for Science and Technology, puts it bluntly when he points out that the system's pluralism has allowed us to avoid dealing "directly with the ideological problem of what the total relationship of the government and universities should be. If we had had to face these ideological and political pressures head-on over the





past few years, the confrontation probably would have wrecked the system."

That confrontation may be coming closer, as Federal allocations to science and education come under sharper scrutiny in Congress and as the partnership enters a new and significant phase.

FEDERAL AID to higher education began with the Ordinance of 1787, which set aside public lands for schools and declared that the "means of education shall forever be encouraged." But the two forces that most shaped American higher education, say many historians, were the land-grant movement of the nineteenth century and the Federal support of scientific research that began in World War II.

The land-grant legislation and related acts of Congress in subsequent years established the American concept of enlisting the resources of higher education to meet pressing national needs. The laws were pragmatic and were designed to improve education and research in the natural sciences, from which agricultural and industrial expansion could proceed. From these laws has evolved the world's greatest system of public higher education.

In this century the Federal involvement grew spasmodically during such periods of crisis as World War I and the depression of the thirties. But it was not until World War II that the relationship began its rapid evolution into the dynamic and intimate partnership that now exists.

Federal agencies and industrial laboratories were ill-prepared in 1940 to supply the research and technology so essential to a full-scale war effort. The government therefore turned to the nation's colleges and universities. Federal funds supported scientific research on the campuses and built huge research facilities to be operated by universities under contract, such as Chicago's Argonne Laboratory and California's laboratory in Los Alamos.

So successful was the new relationship that it continued to flourish after the war. Federal research funds poured onto the campuses from military agencies, the National Institutes of Health, the Atomic Energy Commission, and the National Science Foundation. The amounts of money increased spectacularly. At the beginning of the war the Federal government spent less than \$200 million a year for all research and development. By 1950, the Federal "r & d" expenditure totaled \$1 billion.

The Soviet Union's launching of Sputnik jolted



Even those campuses which traditionally stand apart from government find it hard to resist Federal aid.

the nation and brought a dramatic surge in support of scientific research. President Eisenhower named James R. Killian, Jr., president of Massachusetts Institute of Technology, to be Special Assistant to the President for Science and Technology. The National Aeronautics and Space Administration was established, and the National Defense Education Act of 1958 was passed. Federal spending for scientific research and development increased to \$5.8 billion. Of this, \$400 million went to colleges and universities.

The 1960's brought a new dimension to the relationship between the Federal government and higher education. Until then, Federal aid was almost synonymous with government support of science, and all Federal dollars allocated to campuses were to meet specific national needs.

There were two important exceptions: the GI Bill after World War II, which crowded the colleges and universities with returning servicemen and spent \$11 billion on educational benefits, and the National Defense Education Act, which was the broadest legislation of its kind and the first to be based, at least in part, on the premise that support of education in itself is as much in the national interest as support which is based on the colleges' contributions to something as specific as the national defense.

The crucial turning-points were reached in the Kennedy-Johnson years. President Kennedy said "We pledge ourselves to seek a system of higher education



ation where every young American can be educated, not according to his race or his means, but according to his capacity. Never in the life of this country has the pursuit of that goal become more important or more urgent." Here was a clear national commitment to universal higher education, a public acknowledgment that higher education is worthy of support for its own sake. The Kennedy and Johnson administrations produced legislation which authorized:

- ▶ \$1.5 billion in matching funds for new construction on the nation's campuses.
 - ▶ \$151 million for local communities for the building of junior colleges.
 - ▶ \$432 million for new medical and dental schools and for aid to their students.
 - ▶ The first large-scale Federal program of undergraduate scholarships, and the first Federal package combining them with loans and jobs to help individual students.
 - ▶ Grants to strengthen college and university libraries.
 - ▶ Significant amounts of Federal money for "promising institutions," in an effort to lift the entire system of higher education.
 - ▶ The first significant support of the humanities.
- In addition, dozens of "Great Society" bills included funds for colleges and universities. And their number is likely to increase in the years ahead.
- The full significance of the developments of the past few years will probably not be known for some time. But it is clear that the partnership between the

Federal government and higher education has entered a new phase. The question of the Federal government's total relationship to colleges and universities—avoided for so many years—has still not been squarely faced. But a confrontation may be just around the corner.

THE MAJOR PITFALL, around which Presidents and Congressmen have detoured, is the issue of the separation of state and church. The Constitution of the United States says nothing about the Federal government's responsibility for education. So the rationale for Federal involvement, up to now, has been the Constitution's Article I, which grants Congress the power to spend tax money for the common defense and the general welfare of the nation.

So long as Federal support of education was specific in nature and linked to the national defense, the religious issue could be skirted. But as the emphasis moved to providing for the national welfare, the legal grounds became less firm, for the First Amendment to the Constitution says, in part, "Congress shall make no law respecting an establishment of religion. . . ."

So far, for practical and obvious reasons, neither the President nor Congress has met the problem head-on. But the battle has been joined, anyway. Some cases challenging grants to church-related col-

A new phase in government-campus relationships

Is higher education losing control of its destiny?

leges are now in the courts. And Congress is being pressed to pass legislation that would permit a citizen to challenge, in the Federal courts, the Congressional acts relating to higher education.

Meanwhile, America's 893 church-related colleges are eligible for funds under most Federal programs supporting higher education, and nearly all have received such funds. Most of these institutions would applaud a decision permitting the support to continue.

Some, however, would not. The Southern Baptists and the Seventh Day Adventists, for instance, have opposed Federal aid to the colleges and universities related to their denominations. Furman University, for example, under pressure from the South Carolina Baptist convention, returned a \$612,000 Federal grant that it had applied for and received. Many colleges are awaiting the report of a Southern Baptist study group, due this summer.

Such institutions face an agonizing dilemma: stand fast on the principle of separation of church and state and take the financial consequences, or join the majority of colleges and universities and risk Federal influence. Said one delegate to the Southern Baptist Convention: "Those who say we're going to become second-rate schools unless we take Federal funds see clearly. I'm beginning to see it so clearly it's almost a nightmarish thing. I've moved toward Federal aid reluctantly; I don't like it."

Some colleges and universities, while refusing Federal aid in principle, permit some exceptions. Wheaton College, in Illinois, is a hold-out; but it allows some of its professors to accept National Science Foundation research grants. So does Rockford College, in Illinois. Others shun government money, but let their students accept Federal scholarships and loans. The president of one small church-related college, faced with acute financial problems, says simply: "The basic issue for us is survival."

RECENT FEDERAL PROGRAMS have sharpened the conflict between Washington and the states in fixing the responsibility for education. Traditionally and constitutionally, the responsibility has generally been with the states. But as Federal support has equaled and surpassed the state alloca-

tions to higher education, the question of responsibility is less clear.

The great growth in quality and Ph.D. production of many state universities, for instance, is undoubtedly due in large measure to Federal support. Federal dollars pay for most of the scientific research in state universities, make possible higher salaries which attract outstanding scholars, contribute substantially to new buildings, and provide large amounts of student aid. Clark Kerr speaks of the "Federal grant university," and the University of California (which he used to head) is an apt example: nearly half of its total income comes from Washington.

To most governors and state legislators, the Federal grants are a mixed blessing. Although they have helped raise the quality and capabilities of state institutions, the grants have also raised the pressure on state governments to increase their appropriations for higher education, if for no other reason than to fulfill the matching requirement of many Federal awards. But even funds which are not channeled through the state agencies and do not require the state to provide matching funds can give impetus to increased appropriations for higher education. Federal research grants to individual scholars, for example, may make it necessary for the state to provide more faculty members to get the teaching done.



"Many institutions not only do not look a gift horse in the mouth; they do not even pause to note whether it is a horse or a boa constrictor."—JOHN GARDNER

Last year, 38 states and territories joined the Compact for Education, an interstate organization designed to provide "close and continuing consultation among our several states on all matters of education." The operating arm of the Compact will gather information, conduct research, seek to improve standards, propose policies, "and do such things as may be necessary or incidental to the administration of its authority. . . ."

Although not spelled out in the formal language of the document, the Compact is clearly intended to enable the states to present a united front on the future of Federal aid to education.

IN TYPICALLY PRAGMATIC FASHION, we Americans want our colleges and universities to serve the public interest. We expect them to train enough doctors, lawyers, and engineers. We expect them to provide answers to immediate problems such as water and air pollution, urban blight, national defense, and disease. As we have done so often in the past, we expect the Federal government to build a creative and democratic system that will accomplish these things.

A faculty planning committee at one university stated in its report: ". . . A university is now regarded as a symbol for our age, the crucible in which—by some mysterious alchemy—man's long-awaited Utopia will at last be forged."

Some think the Federal role in higher education is growing too rapidly.

As early as 1952, the Association of American Universities' commission on financing higher education warned: "We as a nation should call a halt at this time to the introduction of new programs of direct Federal aid to colleges and universities. . . . Higher education at least needs time to digest what it has already undertaken and to evaluate the full impact of what it is already doing under Federal assistance." The recommendation went unheeded.

A year or so ago, Representative Edith Green of Oregon, an active architect of major education legislation, echoed this sentiment. The time has come, she said, "to stop, look, and listen," to evaluate the impact of Congressional action on the educational system. It seems safe to predict that Mrs. Green's warning, like that of the university presidents, will fail to halt the growth of Federal spending on the campus. But the note of caution she sounds will be well-taken by many who are increasingly concerned

about the impact of the Federal involvement in higher education.

The more pessimistic observers fear direct Federal control of higher education. With the loyalty-oath conflict in mind, they see peril in the requirement that Federally supported colleges and universities demonstrate compliance with civil rights legislation or lose their Federal support. They express alarm at recent agency anti-conflict-of-interest proposals that would require scholars who receive government support to account for all of their other activities.

For most who are concerned, however, the fear is not so much of direct Federal control as of Federal influence on the conduct of American higher education. Their worry is not that the government will deliberately restrict the freedom of the scholar, or directly change an institution of higher learning. Rather, they are afraid the scholar may be tempted to confine his studies to areas where Federal support is known to be available, and that institutions will be unable to resist the lure of Federal dollars.

Before he became Secretary of Health, Education, and Welfare, John W. Gardner said: "When a government agency with money to spend approaches a university, it can usually purchase almost any service it wants. And many institutions still follow the old practice of looking on funds so received as gifts. They not only do not look a gift horse in the mouth; they do not even pause to note whether it is a horse or a boa constrictor."

THE GREATEST OBSTACLE to the success of the government-campus partnership may lie in the fact that the partners have different objectives.

The Federal government's support of higher education has been essentially pragmatic. The Federal agencies have a mission to fulfill. To the degree that the colleges and universities can help to fulfill that mission, the agencies provide support.

The Atomic Energy Commission, for example, supports research and related activities in nuclear physics; the National Institutes of Health provide funds for medical research; the Agency for International Development finances overseas programs. Even recent programs which tend to recognize higher education as a national resource in itself are basically presented as efforts to cope with pressing national problems.

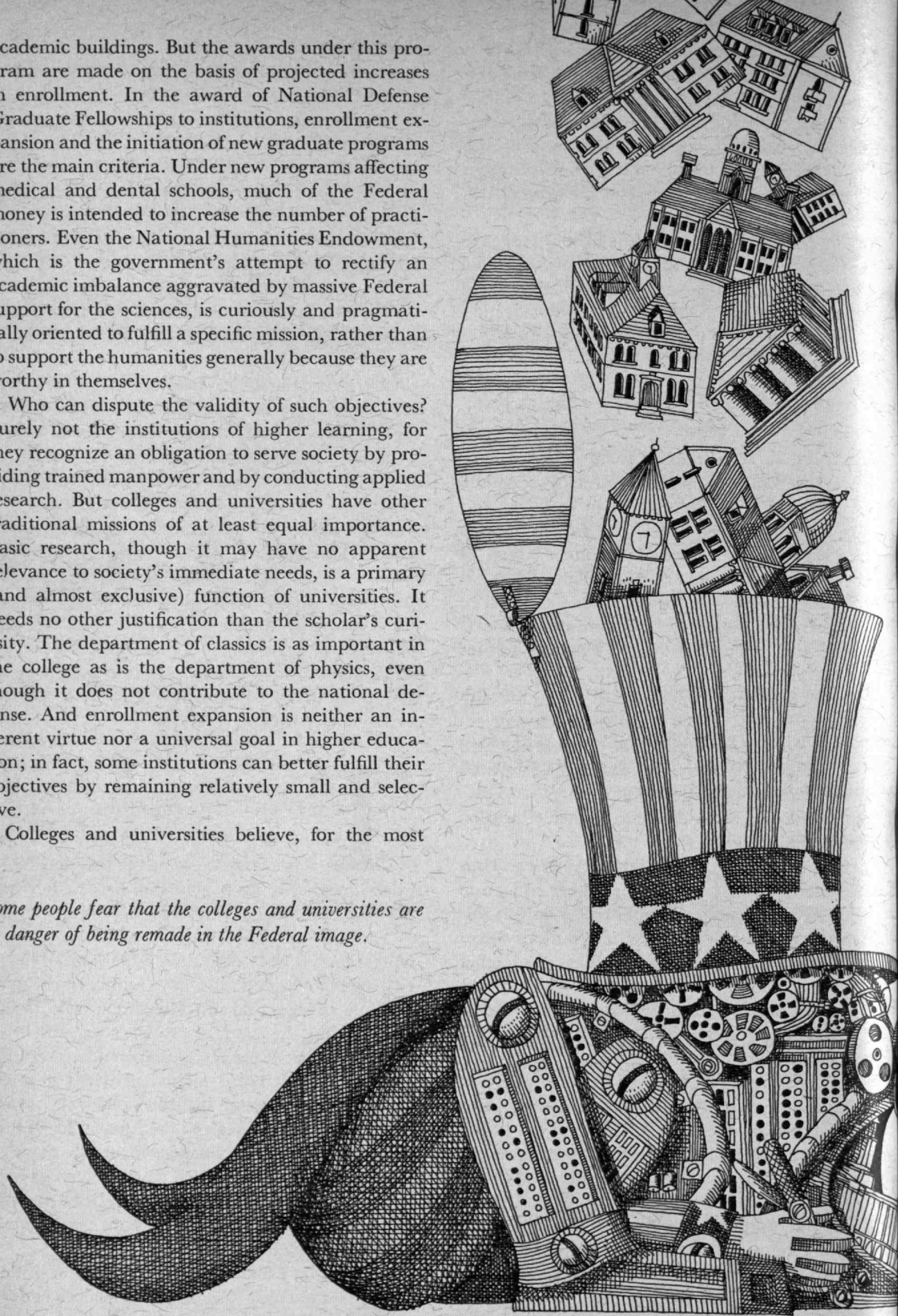
The Higher Education Facilities Act, for instance, provides matching funds for the construction of

academic buildings. But the awards under this program are made on the basis of projected increases in enrollment. In the award of National Defense Graduate Fellowships to institutions, enrollment expansion and the initiation of new graduate programs are the main criteria. Under new programs affecting medical and dental schools, much of the Federal money is intended to increase the number of practitioners. Even the National Humanities Endowment, which is the government's attempt to rectify an academic imbalance aggravated by massive Federal support for the sciences, is curiously and pragmatically oriented to fulfill a specific mission, rather than to support the humanities generally because they are worthy in themselves.

Who can dispute the validity of such objectives? Surely not the institutions of higher learning, for they recognize an obligation to serve society by providing trained manpower and by conducting applied research. But colleges and universities have other traditional missions of at least equal importance. Basic research, though it may have no apparent relevance to society's immediate needs, is a primary (and almost exclusive) function of universities. It needs no other justification than the scholar's curiosity. The department of classics is as important in the college as is the department of physics, even though it does not contribute to the national defense. And enrollment expansion is neither an inherent virtue nor a universal goal in higher education; in fact, some institutions can better fulfill their objectives by remaining relatively small and selective.

Colleges and universities believe, for the most

Some people fear that the colleges and universities are in danger of being remade in the Federal image.



When basic objectives differ, whose will prevail?

part, that they themselves are the best judges of what they ought to do, where they would like to go, and what their internal academic priorities are. For this reason the National Association of State Universities and Land-Grant Colleges has advocated that the government increase its institutional (rather than individual project) support in higher education, thus permitting colleges and universities a reasonable latitude in using Federal funds.

Congress, however, considers that it can best determine what the nation's needs are, and how the taxpayer's money ought to be spent. Since there is never enough money to do everything that cries to be done, the choice between allocating Federal funds for cancer research or for classics is not a very difficult one for the nation's political leaders to make. "The fact is," says one professor, "that we are trying to merge two entirely different systems. The government is the political engine of our democracy and must be responsive to the wishes of the people. But scholarship is not very democratic. You can't vote on the laws of thermodynamics or take a toll on the speed of light. Academic freedom and pure research are not prizes in a popularity contest."

Some observers feel that such a merger cannot be accomplished without causing fundamental changes in colleges and universities. They point to existing academic imbalances, the teaching-versus-research controversy, the changing roles of both professor and student, the growing commitment of colleges and universities to applied research. They fear that the influx of Federal funds into higher education will so transform colleges and universities that the very qualities that made the partnership desirable and productive in the first place will be lost.

The great technological achievements of the past years, for example, would have been impossible without the basic scientific research that preceded them. This research—much of it seemingly irrelevant to society's needs—was conducted in univer-

sities, because only there could the scholar find the freedom and support that were essential to his quest. If the growing demand for applied research is met at the expense of basic research, future generations may pay the penalty.

One could argue—and many do—that colleges and universities do not have to accept Federal funds. But, to most of the nation's colleges and universities, the rejection of Federal support is an unacceptable alternative.

For those institutions already dependent upon Federal dollars, it is too late to turn back. Their physical plant, their programs, their personnel are all geared to continuing Federal aid.

And for those institutions which have received only token help from Washington, Federal dollars offer the one real hope of meeting the educational objectives they have set for themselves.

HOWEVER DISTASTEFUL the thought may be to those who oppose further Federal involvement in higher education, the fact is that there is no other way of getting the job done—to train the growing number of students, to conduct the basic research necessary to continued scientific progress, and to cope with society's most pressing problems.

Tuition, private contributions, and state allocations together fall far short of meeting the total cost of American higher education. And as costs rise, the gap is likely to widen. Tuition has finally passed the \$2,000 mark in several private colleges and universities, and it is rising even in the publicly supported institutions. State governments have increased their appropriations for higher education dramatically, but there are scores of other urgent needs competing for state funds. Gifts from private foundations, cor-



porations, and alumni continue to rise steadily, but the increases are not keeping pace with rising costs.

Hence the continuation and probably the enlargement of the partnership between the Federal government and higher education appears to be inevitable. The real task facing the nation is to make it work.

To that end, colleges and universities may have to become more deeply involved in politics. They will have to determine, more clearly than ever before, just what their objectives are—and what their values are. And they will have to communicate these most effectively to their alumni, their political representatives, the corporate community, the foundations, and the public at large.

If the partnership is to succeed, the Federal government will have to do more than provide funds. Elected officials and administrators face the awesome task of formulating overall educational and research goals, to give direction to the programs of Federal support. They must make more of an effort to understand what makes colleges and universities tick, and to accommodate individual institutional differences.

THE TAXPAYING PUBLIC, and particularly alumni and alumnae, will play a crucial role in the

evolution of the partnership. The degree of their understanding and support will be reflected in future legislation. And, along with private foundations and corporations, alumni and other friends of higher education bear a special responsibility for providing colleges and universities with financial support. The growing role of the Federal government, says the president of a major oil company, makes corporate contributions to higher education more important than ever before; he feels that private support enables colleges and universities to maintain academic balance and to preserve their freedom and independence. The president of a university agrees: "It is essential that the critical core of our colleges and universities be financed with non-Federal funds."

"What is going on here," says McGeorge Bundy, "is a great adventure in the purpose and performance of a free people." The partnership between higher education and the Federal government, he believes, is an experiment in American democracy.

Essentially, it is an effort to combine the forces of our educational and political systems for the common good. And the partnership is distinctly American—boldly built step by step in full public view, inspired by visionaries, tested and tempered by honest skeptics, forged out of practical political compromise.

Does it involve risks? Of course it does. But what great adventure does not? Is it not by risk-taking that free—and intelligent—people progress?

The report on this and the preceding 15 pages is the product of a cooperative endeavor in which scores of schools, colleges, and universities are taking part. It was prepared under the direction of the group listed below, who form EDITORIAL PROJECTS FOR EDUCATION, a non-profit organization associated with the American Alumni Council.

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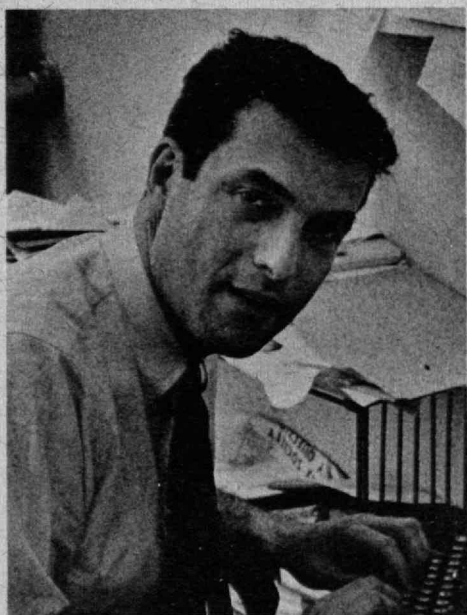
The Federal government's commitment to science has become an important and ever-changing dimension in American life

The New Politics of Science

By Daniel S. Greenberg

LAST YEAR some dozen leaders of the scientific community met privately with several senators to discuss the Federal government's \$16-billion-a-year investment in research and development. (Such legislative-scientific get-togethers, public and private, have become not at all uncommon as the Congress, with a mixture of motives, has sought a better understanding of this newly arrived giant in the economy.) As this particular session got underway, one of the scientists wisecracked, "There has been no presidential directive as to the number of speakers you can have from Cambridge, has there?" It was an "in" joke to an "in" group, and there was no need to answer or elaborate upon the remark.

All those present knew that in the third year of the Great Society, a massive, politically generated turbulence is taking place in the politics of American science, that the long hegemony of Harvard and M.I.T. in Washington science affairs is well on the way out, and that, at Lyndon Johnson's direction, states and regions long outside the mainstream of Federal research money are now being given preferential consideration. Moreover, into this already turbulent scene there has been introduced a separate but related factor—namely, widespread and increasing pressures to prod the scientific community toward greater emphasis on practical, utilitarian research, and, by implication, less emphasis



Daniel S. Greenberg's contributions as news editor of *Science* magazine have brought him a wide and appreciative following among American scientific and political leaders and have given distinction to the American Association for the Advancement of Science, its publisher. Mr. Greenberg has also written for the *Saturday Evening Post*, *The Reporter*, the *New Republic*, and the *Saturday Review*, and his book on *The Politics of Pure Science*, written with the aid of a Carnegie Corporation grant, will be published by the New American Library later this year. *Technology Review* is proud to publish Mr. Greenberg's summary of the growing Federal commitment to the American scientific community, prepared especially for this issue.

Mr. Greenberg studied at Columbia University, served as a reporter for the *Washington Post*, and in 1961 was a Congressional Fellow of the American Political Association.

on basic research. In short, new faces, new values, new goals are now in the ascendancy, and, as a result, the politics of science, probably the least visible, most esoteric of Washington politics, is afloat. What is going on and what does it mean?

TO ANSWER THESE QUESTIONS it is necessary to look at the wondrously amorphous complexity that links science, technology, and government in their multi-billion dollar partnership. Perhaps the best introduction to this is an observation by M.I.T. Provost Jerome B. Wiesner, who served as science adviser to President Kennedy: "Without really having planned it, in fact I would say without really understanding it, we have evolved a system, as we often do in this country, of checks and balances and interactions, that gives us the strongest scientific and technological community you can find in the world." Put another way, no scientific L'Enfant figured in the arrangements under which funds for scores of thousands of research projects are dispensed by multitudes of Federal agencies to thousands of laboratories operated by industry, universities, nonprofit research organizations, and the Federal agencies themselves. But even if no master plan guided the layout of the nation's vast research establishment, fairly durable patterns have come into existence.

In general, their most pertinent features are these: (1) the Federal government provides the money for approximately two-thirds of *all* the research and development activity in this country; (2) most of this Federal money, about 90 per cent of it, is directed toward the attainment of rather clearly defined government objectives, such as a manned lunar landing or cheap atomic power; (3) industry performs most of this research, while universities receive most of the 10 per cent sliver that goes to basic research. But when it comes to matters of influence and prestige, R&D confounds economics by concentrating position and honor upon those whose professional interests are concerned with that 10 per cent sliver. The Nobel prizes, for example, are almost always for work in basic research; the National Academy of Sciences, the honorary apex of American science, is so great a bastion of basic research that the nation's engineers have established their own academy. For, in the technical world, basic research—the quest for the unknown, regardless of its use—is the prestige occupation, the one to which the bright young

men aspire, while they look down upon their more practical-minded colleagues with the sort of disdain that poets might have for those who write labels for canned goods. Edward Teller, himself an accomplished and honored basic researcher, once observed with distress, "Throughout our universities, the best people are brought up with the idea that pure research is the most wonderful thing, the one thing worthy of attention of the best people." Similarly, Alvin Weinberg, Director of the Oak Ridge National Laboratory, has complained that "most of the prestige and emphasis in the university goes to basic science." To which might be added that most of the influential science advisory posts in the upper levels of government also go to basic scientists—or if they are held by engineers, usually they are engineers who revere basic science.

WHEN IT COMES to the actual administration of the government's subsidization of research and development, there prevails a bewildering formlessness. For example, the National Science Foundation was established specifically for the purpose of supporting basic research and scientific education. But since it is politically easier to get money for defense than for science, the Department of Defense this year will outspend NSF in financing basic research, \$265 million to \$196 million. In substance, Defense-supported basic research (in contrast to defense research aimed at military applications) is rarely distinguishable from NSF-supported basic research. It's all science, and the two often go on on the same campus, with nothing to distinguish them but the bookkeeping. (On this point, there is an interesting irony: though the ways of the military are supposed to be anathema to the spirit of scientific inquiry, university scientists often find it far less cumbersome to do business with the Defense Department than with civilian agencies that support basic research. The reason is that Congress tends to be sticky with the civilian agencies, dictating a variety of red-tape procedures for their grantees; on the other hand, it tends to be indulgent with anything that bears a defense label, including research that may have little or nothing to do with things military.)

Proceeding with a brief look into the land of science and government, we find that NSF itself does not conduct any scientific research in the laboratories of other organizations, principally universities. On the other hand, the Department of

Defense and the National Aeronautics and Space Agency run their own laboratories, support research in universities and industry, and have a number of administrative hybrids known as Federal contract research centers—major research facilities, owned and exclusively supported by the agency but under the management of universities. For example, the \$240-million-a-year Jet Propulsion Laboratory, home of the lunar satellites, is owned and supported by NASA, but is run by the California Institute of Technology; however, the bulk of the work is done by industry under contract to JPL. The Public Health Service, which pays for some 40 per cent of all the bio-medical research in the nation, runs its own laboratories and underwrites a vast proportion of research conducted in medical schools; the PHS, however, has no contract centers. On the other hand, the Atomic Energy Commission contracts out the management of its laboratories to individual universities, combines of universities, or industrial firms. The nuclear weapon laboratories at Los Alamos and Livermore, for example, are run by the University of California. The AEC also supports research in university and industrial laboratories, but except for a small, highly specialized laboratory, none of its own employees is directly involved in the actual conduct of research.

Wiesner was not off the mark when he said that this bewildering pattern came about without anyone "really having planned it." The fact is that, beginning with World War II and then under the pressure of the nuclear and space competition of the Cold War, Federal support of the nation's scientific and technical activities simply ballooned at an incredible pace, rising from \$74 million in 1940, to \$1 billion in 1950, \$7.7 billion in 1960, and to \$16.5 billion this year. And Dr. Wiesner was also correct when he added that the system evolved without anyone "really understanding it," for as Federal money poured into science and technology, little if any attention was paid to anything but the science and technology that it was buying. In effect, however, the federally forced growth of science and technology was producing an economic and social revolution on the American landscape, violently affecting patterns of industrial growth, bringing affluence, prestige, and power to a handful of universities, and underwriting the economies of certain regions while heavily handicapping others.

For example, in 1964, universities in California, Massachusetts, and New York received nearly 50 per cent of all Federal funds for research in universities. California, with its heavy concentration of aerospace and electronics industries and research-

A bewildering formlessness in the administration of Federal funds for colleges

oriented universities, received a total of 35 per cent of all federal expenditures—academic and industrial—for research and development. Meanwhile, 15 mountain and west-north-central states together received less than 12 per cent of the total. Massachusetts received 4.2 per cent, which was more than the combined amount going to North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri. Furthermore, as might be expected, Federal research money and scientific and technical talent have tended to follow a highly consistent pattern of geographic togetherness. One measure of this is to be found in the ranks of the National Academy of Sciences, whose membership, totaling 740, is supposed to reflect the highest order of scientific and engineering creativity in the nation. A total of 407 Academy members reside in three states: California, New York, and Massachusetts. Eighty-five per cent of the Academy membership is accounted for by nine states: the three cited above, plus the Maryland-District of Columbia region, Illinois, New Jersey, Wisconsin, Connecticut, and Pennsylvania. Twelve states have no Academy members at all: South Carolina, West Virginia, Kentucky, Mississippi, Arkansas, North Dakota, South Dakota, Nebraska, Oklahoma, Wyoming, Idaho, and Alaska. And, as also might be expected, except for a few variations caused by readily explainable statistical quirks, there is also a close identity between the geographic distribution of scientific talent and Federal funds for research. Further, there is a close identity between regional prosperity and the distribution of Federal funds for research—the depressed areas of the nation do not abound with so-called science-based industry or thriving university science departments.

How did so great a mal-distribution come about, and what does it have to do with the turbulence now running through the politics of science?

THE ANSWERS are to be found in the peculiar origins of the partnership between science and government. Prior to World War II, the parties to this

partnership had little to do with each other. But the atomic bomb, radar, the proximity fuze, DDT, penicillin, and a thousand other devices, materials, and techniques demonstrated that research is an indispensable ingredient of national well-being and power, and it was then that Federal research funds began to flow and scientists were summoned as advisers to the high echelons of government. They came first of all to counsel on the employment of science and technology for military-political purposes; but then, as the demands on science grew, they turned their attention to the health and well-being of this newly recognized national asset, the scientific community. But which scientists were summoned for this counsel, and what values did they bring to the deliberations? If we look at the apex of the science advisory system, namely, the post of White House science adviser and the adjacent 18-member body known as the President's Science Advisory Committee (PSAC), we can obtain some insight into the system. Since 1951, seven men have served, under one title or another, as science adviser to the President. The first, the late Oliver Buckley, former President of Bell Laboratories, held the post briefly before he was followed by a continuing succession of men who shared remarkably similar backgrounds: all were academics from major universities, five of them were from northeastern universities, and all had been during World War II associated with one or both of two great military laboratories, the Los Alamos Scientific Laboratory, where the atomic bomb was fabricated and tested, and the M.I.T. Radiation Laboratory, which was the principal center for radar research. Buckley was followed to the White House advisory post by Lee DuBridge, President of the California Institute of Technology, who was the wartime director of the Radiation Laboratory. DuBridge was succeeded by I. I. Rabi, the Columbia Nobel physicist, who was associate director of the Radiation Laboratory. Next came M.I.T. President James R. Killian, Jr. '26, who during the war had served as vice-president of M.I.T., which operated the Radiation Laboratory for the armed services, and who was on the Laboratory's steering committee. He, in turn, was succeeded by George Kistiakowsky, a Harvard chemist, who served at Los Alamos. Kistiakowsky was followed by Wiesner of M.I.T. who served at both wartime laboratories, and Wiesner was succeeded by the present incumbent, Donald F. Hornig, a Princeton chemist who served at Los Alamos. As for PSAC, which is an adviser to the adviser, its membership was consistently weighted toward the academic physical

Science thrives magnificently

sciences; and from the beginning, approximately one-third of its membership was drawn from the Harvard and M.I.T. faculties, with much of the remainder coming from major West Coast universities, plus a sprinkling of executives and researchers from scientifically advanced industrial firms.

Now, what were the values, sensitivities, and forces affecting these White House policy advisers, and, equally important, the scientists and engineers who were drawn into government service—often upon the recommendation of the White House group—to serve as administrators of the Federal agencies that actually dispense money for research and development? In general, until the late 1950's experience in science and technology related to nuclear weaponry, missilery, and space governed their appointments, for these subjects were the main concerns in the early days of PSAC. The prime objective of government's mushrooming investment in research and development was to obtain supremacy for this country, without regard to the costs or the subsidiary problems of regional economic impact or equity of distribution. As Defense Secretary McNamara bluntly declared when a group of Midwest legislators protested California's dominance in federally supported industrial research and development: "We seek the best brains and we go where they are. And generally speaking, they are not in the Midwest." A great irony of the situation and of midwestern discontent, however, is that midwestern universities produce nearly 40 per cent of the nation's Ph.D.'s in science and engineering, but employment opportunities in technologically advanced industry predominate elsewhere. The Midwest, with its concentrations of consumer industries, ends up as a net exporter of technical talent to states that were early arrivals in such fields as aerospace and nuclear energy. Thus, the bulk of research and development money was ladled out early in the game principally with a view to getting the job done. Whether or not an aerospace plant might do wonders for Appalachia or Indiana was irrelevant; industrial offshoots of California's World War II aviation industry were already primed for aerospace work; and once they got a bit of it, they were all the more qualified for the next contract.

But what of research in universities, which is mostly fundamental in nature? Here, too, there tended to prevail the system of those who have, get more. But in this case, it was further reinforced

while those who have research and development get more

by the academic scientists' memories of science's prewar penury and their traditional fears of government interference with the intellectual freedom of science. How were subsidy and independence to be reconciled? The answer was found in the mechanisms that academic science devised for distributing government research funds. Research money was not to be distributed to regions, states, or even particular institutions. Rather, it was to be distributed for scientifically worthy projects—selected purely on their scientific merits, regardless of where they might be located. This style of operation came to be known as the "project system." How was it to be administered? By an accompanying technique known as the "peer system," an arrangement under which scientists active in a particular field would periodically assemble in Washington to evaluate applications for support of research in that field. Under this twofold arrangement, political intervention could be fended off with the argument that scientific quality, not the rivers and harbors approach, was the underlying criterion for deciding who was to share in the postwar gusher of Federal support for research. But though the funds were enormous by prewar standards, there actually never was enough to go around for all the applicants, and this brought into play another principle: priority was to be given to the support of research; the budgets of the research agencies were not to be used to build up institutions that did not have the staff or equipment to compete for research support.

As NSF Director Leland J. Haworth observed last year in a talk to the Association of State Colleges and Universities, the Foundation's initial programs "inevitably resulted in grants going in the main for the support of our leading scientists who were predominantly on the faculties of a relatively restricted number of universities which had attained a high level of excellence long before the existence of any significant program of Federal support . . ."

The inevitable outcome of this system was that American science thrived magnificently. Out of 128 Nobel prizes awarded prior to World War II, Americans received only 15; since World War II, they have received approximately half of the awards. Prior to the war, an advanced scientific education was, with few exceptions, considered incomplete without study in Great Britain or Western Europe; today traffic is to these shores, and often it is a one-way trip.

However, while science and technically advanced

industry thrived under Federal support and the project and peer systems, the rich got very richer while the poor got only a little richer. The universities in Cambridge and California had excelled before the advent of federal support; when the support began to flow, the criteria of distribution guaranteed them fat shares. In effect, the scientists had established a marvelously closed system. Money went to the best scientists, and the best scientists decided who was to get the money. According to one study, 10 universities that received 38 per cent of Federal funds for academic research provided 36.8 per cent of the advisers who counseled on the distribution of the money.

SCIENTIFICALLY, it was unquestionably an effective system, one that contributed enormously to the postwar pre-eminence of American science. Politically, however, it was untenable, especially after a Defense Department study, issued in 1962, noted, "Management planners, in considering sites for new or expanded facilities, have found that the availability of trained minds overshadows even such factors as the labor market, water supply, and power sources. The evidence is overwhelming: Route 128 encircling Boston, the industrial complex around San Francisco Bay, that related to the California Institute of Technology and UCLA in the Los Angeles area, and similar situations are cogent examples of industry clustering around centers of learning." Evidence to the contrary, such as the growth of advanced industry in the less-than-academically-advanced Southwest, or the relative absence of such industry around many of the great midwestern universities, did not impress Congressmen who were eager to bring industry to their constituents. Whatever the actual economic impact of university science might actually be (and it is a matter that is by no means clear) they wanted a piece of it, and they were not much interested in the scientists' fine distinctions between research and development. As Senator Ellender, of Louisiana, once said, in reference to the Federal government's multi-billion R&D budget—"it's all science," and the scientists in the audience gasped.

Furthermore, as is often the case when political passions are ignited, little attention was paid to a curious disparity that prevailed between the raucous

complaints of some of the self-styled have-nots and the realities of hard statistics. While the Midwest, for example, purveyed an image of being locked out of Federal support of both academic and industrial research, the facts are that five midwestern universities last year ranked in the top 15 academic recipients of Federal research funds; that in terms of total Federal support, the University of Michigan was second in the nation, receiving \$58,805,000, compared with \$59,601,000 for M.I.T. Tenth on the list was Harvard, with \$40,802,000, about \$1 million more than the University of Wisconsin and \$4 million less than the University of Illinois. On top of this, it could also be pointed out that something of a revolution has been occurring in this nation in the distribution of Ph.D.-awarding institutions. In 1920, for example, universities in New York, New England, and New Jersey produced 41 per cent of the nation's Ph.D.'s. In 1962, their contribution had declined to 27 per cent. The spread of higher education across the American landscape is best seen in the figures for a few states. In 1929, Florida produced not a single Ph.D.; in 1961, it accounted for 1.57 per cent of the nation's total output; Texas, in the same period, went from .49 per cent to 2.61 per cent. But, if these shifts did anything, they simply whet the appetites of these regions for more of the same.

Consequently, over the harsh cries of those who had long administered the affairs of science, the "have-nots" have been employing political means to wrench shares out of the system. Two years ago, for example, Congress decreed that the National Science Foundation was to set aside \$40 million of its budget for the exclusive purpose of developing new academic centers of scientific excellence. NSF was wholly in favor of this objective and had, in

fact, proposed the idea in response to congressional pressures. But Congress provided NSF with little additional money to support the \$40 million program. The amount was to be obtained by diverting funds that, to a large extent, would otherwise have gone to institutions long in the mainstream of Federal support for research. Not long afterwards, a new geographic flavor began to develop in appointments to the President's Science Advisory Committee. As the terms of the Harvard and M.I.T. members expired, they were replaced by scientists and engineers from other regions, until there now remains only one member from Cambridge. In September of last year, the President himself gave formal ratification to the cries of the have-nots when he issued a diplomatically worded directive that actually spelled the end of the system that guaranteed that the rich get richer. Titled, "Strengthening Academic Capability for Science Throughout the Country," it stated: "Our policies and attitudes in regard to science cannot satisfactorily be related solely to achievement of goals and ends we set for our research. . . . We must, I believe, devote ourselves purposefully to developing and diffusing—throughout the nation—a strong and solid scientific capability, especially in our many centers of advanced education. . . . At present, one-half of the Federal expenditures for research go to 20 major institutions, most of which were strong before the advent of Federal research funds. . . . Strong centers have developed in areas which were previously not well served. It is a particular purpose of this policy to accelerate this beneficial trend since the funds are still concentrated in too few institutions in too few areas of the country."

Coincidentally with these moves toward a greater geographic distribution of research funds, the John-

America's scientific community must face the realities and capitalize upon the opportunities of the emerging new politics of science

son administration, with its commitment to rapid social engineering, has shown an increased interest in the contention that a good deal of basic research is too remote from possible applications to human needs. Last June, after meeting with several of his top medical advisers, the President said of the Public Health Service's \$800-million-a-year investment in biomedical research, "I am keenly interested to learn not only what knowledge this buys but what are payoffs in terms of healthy lives for our citizens." Later, it was reported that Mr. Johnson was concerned about reports that too much research was being carried on "for the sake of research alone." Independently of this, the House last year passed legislation authorizing the National Science Foundation to engage in applied research, particularly on problems of environmental pollution, but without any accompanying guarantee that additional funds would be provided if this new responsibility is added to the Foundation's present mandate to limit itself exclusively to basic research. Meanwhile, the Defense Department, long a supporter of basic research, is going through rounds of soul-searching as to whether it is getting its money's worth out of these expenditures. And the space agency, with its *idée fixe* of a manned round trip to the moon in this decade, regularly dips into its basic research budget whenever funds are required to keep the moon program on schedule. The trends toward broader geographic distribution and utilitarian research cannot be attributed to any particular faction. There are no prominent spokesmen for less basic research, and even the affluent Cambridgeites readily concede that it would be a good idea to build up new centers of research throughout the nation. If causes of the trends are to be sought they are in the economic yearnings of the less developed regions of the nation and in a general impatience with the necessarily slow and uncertain pace with which the knowledge produced through basic research is incorporated into utilitarian forms.

FINALLY, there is another factor that helps explain the progress of these trends. Science, unlike agriculture, labor, or business, did not fight its way to a place in Washington. It was *invited* there, because the politicians concluded they needed science, and generally taking the scientists on faith, gave them what they sought. As a consequence, science, despite the popular fables of the influence it radiates through government, has not acquired the ex-

perience or mechanisms for operating in a political milieu and is actually rather inept when it comes to bucking political adversity. For example, academic science is heavily dependent upon the support of the National Science Foundation, but the Foundation has never been able to muster any significant support from its university constituents when Congress axes its budget. Many scientists are grievously concerned about the possibility of a trend away from basic research; but, politically, they don't know what to do about it. Furthermore, with the war in Viet Nam consuming great chunks of the Federal budget, the have-nots realizing their strength, and basic research under critical scrutiny, painful financial spasms are beginning to be felt in what have heretofore been some of the most productive centers of American science. For the fact is that the administration has not chosen to expand budgets to accommodate fully the costs of on-going research, the development of new centers for research, and an expansion of applied research. A bit more money has been put into the system. For example, the Defense Department has added \$20 million to its research budget simply to build up new centers of academic research. But the American scientific enterprise is now a huge and costly affair that requires, according to various estimates, increases of 5 to 15 per cent simply to stand still. Within a total research and development budget of some \$17 billion there are inevitably sizable annual fluctuations that make it difficult to obtain a realistic picture of what is actually happening to the level of scientific effort in the nation.

In the Federal budget for the fiscal year that starts next July, expenditures for research and development are scheduled—Congress willing—to rise from the present \$16.5 billion to slightly over \$17 billion. In terms of the appetite of the nation's research and development enterprise, and the many politically certified objectives—such as pollution control, for example—that can be attained only through R&D, the increase is trifling; furthermore, when the sums are subjected to scrutiny, it appears that there may be more appearance than reality to the supposed increases. The budget for basic research is described as increasing by \$286 million, but two-thirds of this is credited to space research and most of it is charged to the cost of launch vehicles.

Meanwhile, the congressional pressure of the have-nots is increasing. Last August, for example, Senator Fred R. Harris, chairman of a Senate subcommittee on research, fiercely assailed the White House science adviser and the director of the Na-

tional Science Foundation for not implementing the President's directive more rapidly. But in the laboratories of major institutions, they will tell you that money for important research has, in many instances, slowed to a trickle. James A. Shannon, the highly respected and plain-talking director of the National Institutes of Health, recently said, "We now find ourselves faced with a situation in which the rate of increase of funds for the support of research cannot support a substantial number of newly developed young scientists." To which Shannon added that his agency did not have the money to carry out its scientific responsibilities and simultaneously build up new centers of research throughout the country.

Last spring, the American Society of Biological Chemists adopted a resolution that reflected its concern and, incidentally, the amorphousness of the science-government relationship (it was vaguely addressed "to those responsible for Federal policy concerning support of fundamental research"). The resolution noted that many young researchers coming out of federally supported graduate programs were unable to obtain funds for the research career that the government, in effect, had prepared them. The resolution was undoubtedly highly self-serving. The biological chemists are, in the main, basic scientists, and they want money to pursue their interests. But, in arguing their case, they offered a point that commands serious respect: "As our nation undertakes to address those serious and immediate problems which affect our society and ourselves and which urgently require technical solutions, we must never lose sight of the fact that the technology of tomorrow must rest on the fundamental research of today."

Unfortunately, the fundamental research of today is beginning to suffer from a desire for quick results and from plain old pork-barrel pressures. There is no reason why research should be granted immunity from the political process; science, in all its ramifications, is not exclusively the business of scientists. But if science is to continue to be productive, it is necessary to recognize that it is an activity that has peculiar vulnerabilities. Sudden fluctuations in research support can be ruinous to research teams, which are difficult to assemble and easy to disrupt. Furthermore, just as there are only so many .300 hitters in baseball at any one time, there are

today only so many productive scientists in the nation. It may be politically attractive to channel Federal research funds in a fashion that will spread scientific talent to the hinterlands. But little if any scientific quality is likely to result from scattering the members of productive research teams.

As far as the pressures for putting science to work on current problems are concerned, it would be useful to keep in mind that basic research represents no more than 10 per cent of the nation's total technical effort. In our impatience to solve the critical problems that afflict society, there is an understandable impatience with the uncertain and unpredictable progress of basic research. Several years ago, it is illuminating to recall, this impatience resulted in Congress forcing the National Institutes of Health into a program to screen hundreds of thousands of substances to see if a stab in the dark might turn up something that would be effective against cancer. The program, costing hundreds of millions of dollars, was resisted by many cancer researchers on the grounds that the resources might be better applied to seeking an understanding of the fundamental mechanisms of cancer. It is now generally felt that, despite a few hopeful leads from this vast undertaking, the screening program consumed money and manpower entirely out of proportion to its contribution to the solution of cancer.

The current political problems of science are not at all assisted by the general reluctance of the leaders of science to set forth any order of priorities in research. In their view, all science is equally important—whether it is in the medical area or in determining the chemical composition of Mars. Scientifically, they may be right; politically, however, their position is getting to be untenable. There is no doubt that science is too important to be left exclusively to scientists; there is also no doubt that science is too valuable and too vulnerable to be subjected to the vagaries of pork-barrel politics and clumsy pressures to increase the production of golden eggs. To protect the viability of science and, at the same time, to respond to society's needs for the services that only science can provide is a task that calls for the very highest order of scientific statesmanship. There now prevails a new politics of science, and the scientific community, at all levels, would be wise to recognize its realities, dangers, and opportunities.

*Five guidelines will help colleges
and universities and their faculties
chart a course which fulfills their obligations:*

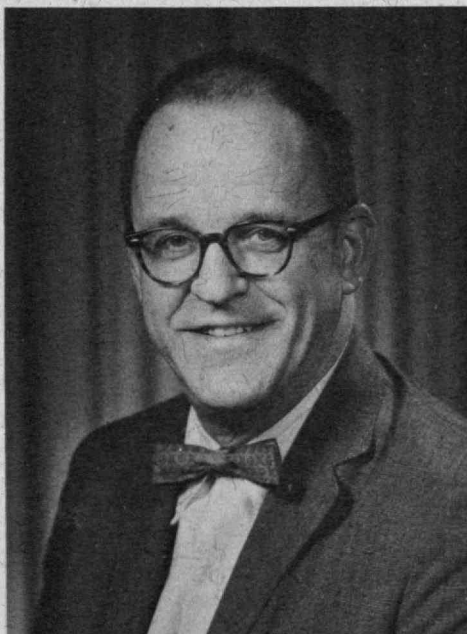
Academic Integrity and Public Service

By Max F. Millikan

THE ADVENT OF the Kennedy administration in Washington in 1961 ushered in a new era of co-operation between universities and government. There was a new conviction that the research that scholars had been pursuing on college campuses could be brought to bear effectively on the urgent problems of East-West relations, of economic and political development abroad, and even of peace and war with great benefit both to the national interest and to the advancement of knowledge. Professors flocked to Washington to high office and were posted to several key embassies, and government-sponsored research projects proliferated on university campuses.

This atmosphere of collaboration has recently sharply deteriorated. There are many reasons for the change, including disenchantment in some university circles with aspects of foreign policy, such as our activities in Viet Nam and the Dominican Republic, and the style of Lyndon Johnson, somewhat less congenial to the academic mind than that of John Kennedy.

But an important factor contributing to the deterioration has been the publicity given to a variety of kinds of relations between the academic world and government agencies in the foreign policy field. The most recent disclosures focus on covert CIA support of student, labor, and other organizations.



Max F. Millikan is professor of economics and director of the Center for International Studies at M.I.T.; his principal publications have been in the fields of foreign aid and economic development. A graduate of Yale University (B.S. in physics, 1935, and Ph.D. in economics, 1941), Dr. Millikan served on the staff there for 11 years, held various government posts in the Office of Price Administration, War Shipping Administration, and Department of State from 1942 to 1946, came to M.I.T. in 1949, and was on leave in 1951 to serve as assistant director of the Central Intelligence Agency. He is a trustee of the Carnegie Endowment for International Peace, president of the World Peace Foundation, and a member of various advisory committees in the fields of economic policy and foreign relations. As Director of the M.I.T. Center for International Studies, Dr. Millikan is responsible for academic research in support of educational activities in economic and political development, international communication, and military and foreign policy.

To preserve the moral principles which guide academic inquiry

These activities raise fundamental questions about the conduct of foreign affairs in an open society, but they have little or no direct bearing on the relations between research scholars and government. Nonetheless they have contributed to the acrimony of the debate on university campuses as to whether the scholar can serve his government without violating the moral principles which should guide academic inquiry. More directly relevant to university research activities was an earlier series of news stories about government sponsorship of university research abroad. Project Camelot, a study of the origins of violence in underdeveloped countries conducted by American University under contract with the United States Army, was canceled when critics in Chile charged it was a thinly disguised plot to spy on Chilean political secrets and pave the way for possible U.S. military intervention. The Central Intelligence Agency was reported to have been involved in a project carried out in Viet Nam by Michigan State University under contract with the Agency for International Develop-

ment and there were allegations that CIA had used the project as a cover for other activities.

Our own Center for International Studies for some years did open research for CIA, as well as for numerous other governmental and private sponsors. The work financed by CIA was essentially library research on international matters conducted for the most part in Cambridge, the principal results of which were published. Our program aroused public comment only when these other developments had raised academic temperatures.

One set of scholars has reacted with great indignation to these various disclosures. In the minds of the more extreme academic purists, any relationship with government, particularly in the social sciences, is now tainted and the only safe course for universities is to insulate themselves from such contacts. One professor said recently, "Universities are dedicated to the truth; governments lie. Therefore universities should not work for governments."

This position has been met with an equally morally outraged defense from another group of



university professors. These people start from the premise that the most solemn obligation of a citizen is to put his talents at the service of his community. If the academic purists had more sense of social responsibility, these defenders contend, they would do their best to try to help government behave more intelligently rather than dissociate themselves from it. The government of the United States is, after all, not a force hostile to and separate from the academic community. It is our government. It is even our CIA. And if it behaves badly, as it certainly does occasionally, it is the responsibility of everyone with relevant skill and training to help it behave better.

For a third group of scholars a set of practical considerations is the source of much greater concern than issues of principle. This practical problem is what we may describe as the "cosmetic effect" of accepting government sponsorship for research. Whatever the facts, so these people argue, it is widely believed, especially abroad, that any scholar supported by funds from certain government agencies must be committed to the defense of a particular policy line, or worse, must be using his status as scholar as cover for some clandestine activity. Attacks on American scholars and university groups as agents of the U.S. Government have appeared with increasing frequency in the press in Latin America, India, and Africa. This image of government-sponsored research, however distorted, injures the reputation of all university researchers; and scholars who are connected with institutions that accept such contracts, these critics argue, will be prevented by these suspicions from conducting effective foreign research. There can be no question that this image effect is real and serious, and that corrective measures by both universities and government are called for.

The sad thing about the current debate over government contract research, whether conducted on moral or pragmatic grounds, is that so much of it fails to come to grips with the real issue of how to preserve genuine academic integrity and public reputation and at the same time serve the national interest. There is no real difference of view that both these sets of values are of great importance. The academic purists are certainly right that the great universities, in both their research and educational functions, must be dedicated to the pursuit of truth wherever that pursuit leads. I know of no serious dissent from this basic principle in any part of the academic community. To protect this value and to instill it in the minds of students, it is essential that universities maintain to the maximum possible degree an atmosphere of free and open inquiry

in which both the evidence and the reasoning on which conclusions are based are open to examination. As a corollary it is essential that scholars dedicated to the open pursuit of truth be candid about what they are doing and why they are doing it.

At the same time the defenders of government sponsored policy-relevant research are correct in pointing out that the university social scientist can greatly improve the rationality of public policy by bringing his scholarly discipline to bear on the issues confronting responsible decision makers both at home and abroad. Academic research has greatly increased our understanding of such questions as why the gap in incomes between rich and poor countries is widening rather than closing, why disaffected groups in some countries resort to violence and in others do not, why political institutions are effective in some countries and fall apart in others, what the actual distribution of popular attitudes toward competing ideologies and national goals is in countries like Viet Nam. The images that American policy makers have of even such relatively inaccessible countries as Communist China can be substantially corrected by careful scholarship.

Some of the problems of reconciling academic integrity and national service are real and some are illusory or trivial. Some relate to real principle and some to appearances. We must examine these conflicts more carefully before considering solutions.

LET US FIRST dispose of the fear that scholars will be pressed by government to act as spies or covert agents. All governments including our own sometimes find it necessary in the national interest to act clandestinely. Universities and scholars attached to them should have no part in such activities. If they did it would indeed be an intolerable abuse of academic freedom. I do not think that it is in fact an important real issue, because the conflict with academic morality is so clear that it has seldom been proposed by government agencies and in my experience has never been accepted by a university.

There is, however, a real problem of the university image here. Suspicion is widespread abroad partly because it is difficult to prove good faith and partly because some kinds of inquiry that we regard as wholly public and legitimate are regarded in other cultures as equivalent to spying. Opinion polling and attitude surveys, for instance, are accepted practices in the United States and Europe but deeply suspect activities in many parts of the

world, especially when conducted by foreign researchers, however impeccable.

A less dramatic, but to my mind more serious concern, is that government agencies will try to use their financial controls to influence the conduct or the conclusions of research activities. Direct pressure to alter conclusions or make them support currently announced policy is in my experience rare. But there are many subtle and less obvious ways in which a sponsor can inhibit the freedom of academic inquiry.

The sponsoring agency may try to restrict the scope of a study or suppress or modify conclusions out of fear that its financing of the research may be misinterpreted by the Congress or the public as policy agreement. Or it may be tempted to keep from public circulation research conclusions that run counter to some American policy position. Or it may worry about embarrassment abroad if a study contains explicit or implicit criticism of the stability or effectiveness of a foreign government or foreign institutions. As Bernard Fall said in his book *Viet-Nam Witness 1953-66*, "When social-science research has reasons-of-state limitations placed upon its conclusions, it runs into heavy risks of losing its validity . . ." The State Department, as a result of the Camelot affair, has established elaborate machinery to review all proposals for government-sponsored research on foreign areas to insure so far as possible that such studies are not likely to damage our foreign relations. The principle implicit in these procedures—that the government takes responsibility for the conduct and conclusions of research for which it provides the financing—is pregnant with risks for academic integrity.

A third and in many ways particularly difficult set of problems involves research utilizing classified materials and the security clearances that accompany it. Governments exaggerate the need for classification, and when universities accept it they limit their freedom of publication, restrict the atmosphere of open inquiry, and inhibit collaboration with foreign and other uncleared scholars. Yet a convincing case can be made for the necessity in the national interest of giving some academic researchers clearances and access to some classified information.

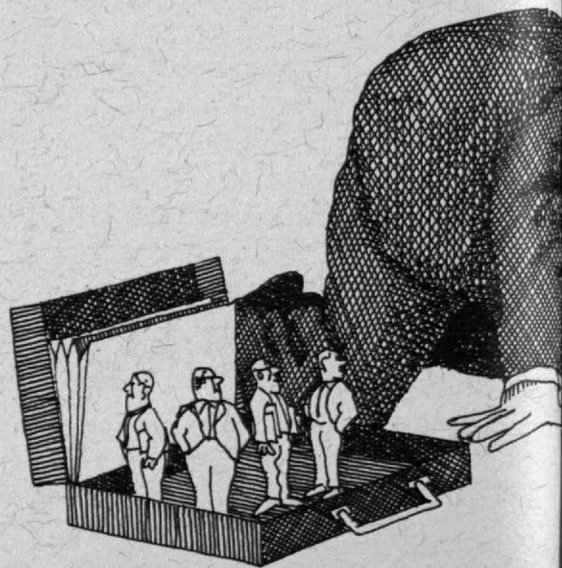
In contrast to some fields of engineering, social scientists seldom seek access to classified material because they believe classified data are essential to their research, although there are instances, as in the analysis of interviews with defectors from Russia in the Stalin era or in Viet Nam today, where such access is indispensable. The more telling

To preserve the atmosphere of free discussion and inquiry

argument pertains to the nature of the relationship between academics and policy-makers. Those responsible for policy can derive full value from academic researchers only if they can occasionally communicate in complete confidence about policy alternatives and the implications for them of academic work. This may require that the scholar be privy to confidential information about situations in foreign countries and policies being discussed within our own government.

To engage in this sort of dialogue, moreover, the scholar must occasionally be willing to relinquish his freedom to make public some of his conclusions, especially when they touch upon policy matters. The government may have a legitimate concern that the public, both at home and abroad, will confuse policy exploration with what has already been agreed upon. The policy maker may, for example, wish to explore with qualified academic experts the probable consequences for the economy of country X of a doubling of U.S. foreign aid without generating unwarranted expectations in the country in question that this in fact will be done. The policy maker can engage in this kind of fruitful dialogue only if some restrictions are placed upon the freedom of the scholar to report what is in the documents he has been allowed to see.

Such considerations as these—the foreign suspi-



cion of government sponsored university work, the risks of limits on academic independence, and the constraints implicit in security classification—pose complex problems of divided loyalties for the academic. If he or his institution takes the purist position that the only way to avoid these dangers is to have nothing whatsoever to do with his own government, or with classified work of any sort, his potential public service will be very sharply restricted. On the other hand, at the opposite extreme, if he guides himself only by the public interest as defined by government, he may do irreparable damage to university tradition of which he is a part. We need much more constructive discussion of how to steer an acceptable course between these two extremes.

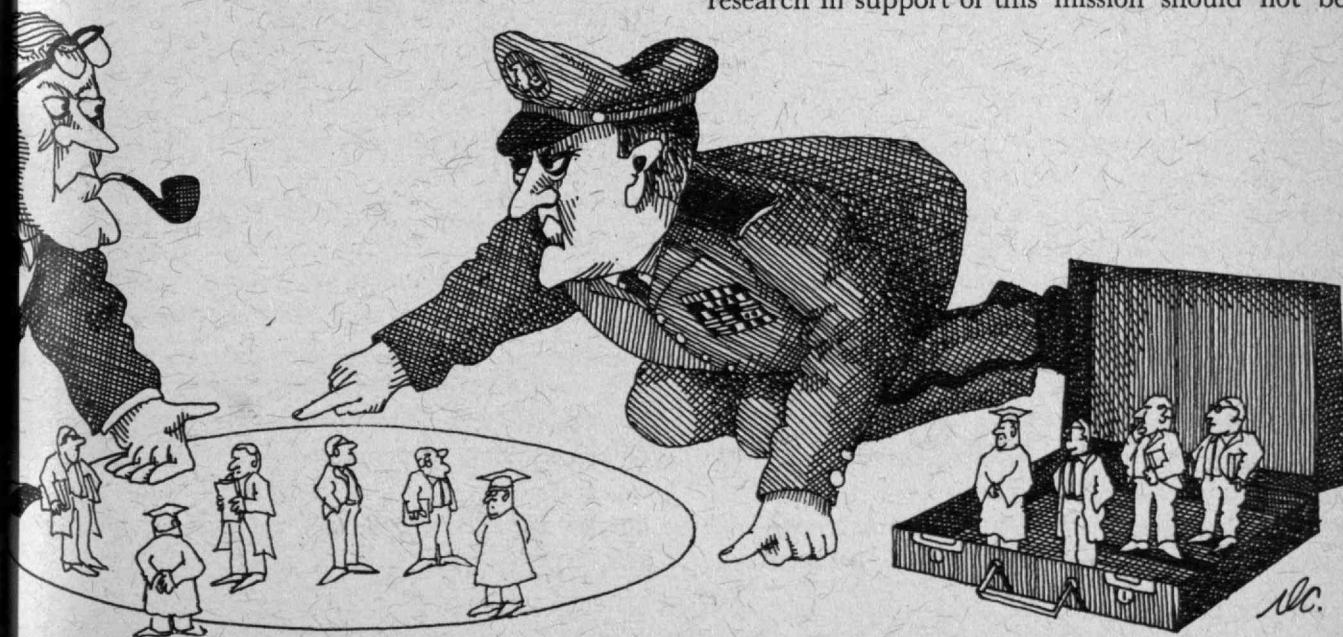
SOME OF THE SOLUTIONS to this dilemma now proposed or in practice seem to me to be not solutions at all. One commonly suggested answer is to discriminate not according to the nature of the work to be done, the controls exercised, or the terms and conditions of the relationship, but simply according to the name of the sponsoring agency. Some scholars will work for the State Department or the Arms Control and Disarmament Agency or AID, but not for one of the armed services. Others will work for the armed services but not for the Central Intelligence Agency. This identification of certain bureaucratic divisions of the national government as well motivated and moral and others as danger-

ous, uncontrollable, and immoral involves a peculiarly silly form of the anthropomorphic fallacy of treating organizations as personalities.

The Central Intelligence Agency is most frequently singled out as the one organization most likely to corrupt the academics who deal with it. The CIA engages in many activities with which no university or university scholar having any concern for the principles of his profession should have any connection whatsoever. So do many other government organizations. Lack of candor is not confined to the CIA, but its public image is undeniably that of a clandestine agency devoted to spying and covert operations. If it were only that, universities should indeed be wary.

The CIA performs, however, another even more important function, poorly understood in the popular mind, to which scholarly research is eminently relevant. It is charged by legislation with the formal obligation of producing for the President and the National Security Council the authoritative government interpretation and estimate of the political, economic, social, and military forces at work in the world which shape the international environment in which United States policy must be made. Similar functions are performed in other agencies of the government, but it is the director of CIA who is responsible for co-ordinating these estimates and appraisals, drawing for the purpose upon all sources of information, public and private, overt and covert. It is not an accident or a mistake that the word "intelligence" is used in government to describe this function. Its identification in the public mind with spying and deception is a gross distortion of the most vital tasks of government intelligence.

The full relevance and legitimacy of academic research in support of this mission should not be



To provide an embodiment of the conscience of the community

subject to question so long as it is conducted under terms and conditions which permit academic integrity and objectivity to be preserved. Our Center until last June (1966) maintained a research relationship with CIA under which we did studies, mainly concerned with developments in the Communist world, virtually all of which have been published. For example, during the Stalin era when the cold war was at a peak of intensity there were those in government who believed the Soviet system might be vulnerable to efforts to bring about its downfall. As an outgrowth of a project on communication done for the State Department, our Center was asked by CIA to review for the National Security Council the growing body of academic literature on economic, political, and ideological developments in the Soviet Union and appraise its implications for U.S. policy. We drew heavily on work done by Harvard on the Soviet social system under an unclassified contract with the U.S. Air Force. The major results of our published work were tested against classified information coming out of such sources as defector interviews. Policy memoranda resulting from this review had, I believe, some influence in the development of a more realistic appraisal in Washington of the stability and evolution of the Soviet system and the possibilities of coexistence with it.

Our Center felt compelled by misunderstanding at home and abroad of the functions of the CIA to discontinue our contracts with this agency. However, for the reasons I have outlined, I do not regard this as even a partial solution to either the substantive or the cosmetic problems of government contract work.

THE ARMED FORCES support much fundamental social science research on international problems, such, for example, as a study we are conducting of how radio broadcasting, exchanges of visitors, and scientific contacts affect various groups in Communist countries. And yet acceptance of military contracts like this carries no implication that the academic institution involved is committed to a military view of American foreign policy. To limit research contracts to agencies whose titles have a peaceful or constructive connotation may appear to serve a public relations purpose for universities,

but it neither guarantees effective public service nor by itself serves to protect academic integrity. The problem of the university image must be tackled in more fundamental ways than by trying to put a few agencies in quarantine.

A second mode of dealing with the problem, one that has been adopted by Harvard University among others, is to accept no government contracts providing for clearance of personnel, handling of classified material, or production of classified reports. For reasons already outlined I believe that if this rule were strictly observed by both individual scholars and the institutions to which they belong it would restrict unduly the effectiveness of university research on behalf of government and considerably reduce the influence of scholars on the analyses underlying critical foreign policy determinations.

This position of principle is considerably weakened, in any case, by the fact that it is not generally extended to individual scholars within the university community. Many Harvard professors with international expertise have personal security clearances, many of them individually receive and examine classified material in their university offices and even produce classified memoranda.*

This situation is defended in terms of a third rule frequently advanced for dealing with this dilemma which impresses me as being at least as unsatisfactory as the other two. This is to make a sharp distinction between the university as an organizational entity and the individual scholars who are employed by it and who collectively comprise it. According to this rule, for which its defenders seek support by appealing to academic freedom, the individual scholar is free to do anything he likes so long as no administrative official representing the university has put his name to any contract document which legally binds the institution. Supporters of this rule variously argue, depending on their point of view, that universities should not work for CIA, or accept classified contracts, or accept any control of their research by financial sponsors, but that it is the scholar's own business whether he does any of these things as an individual.

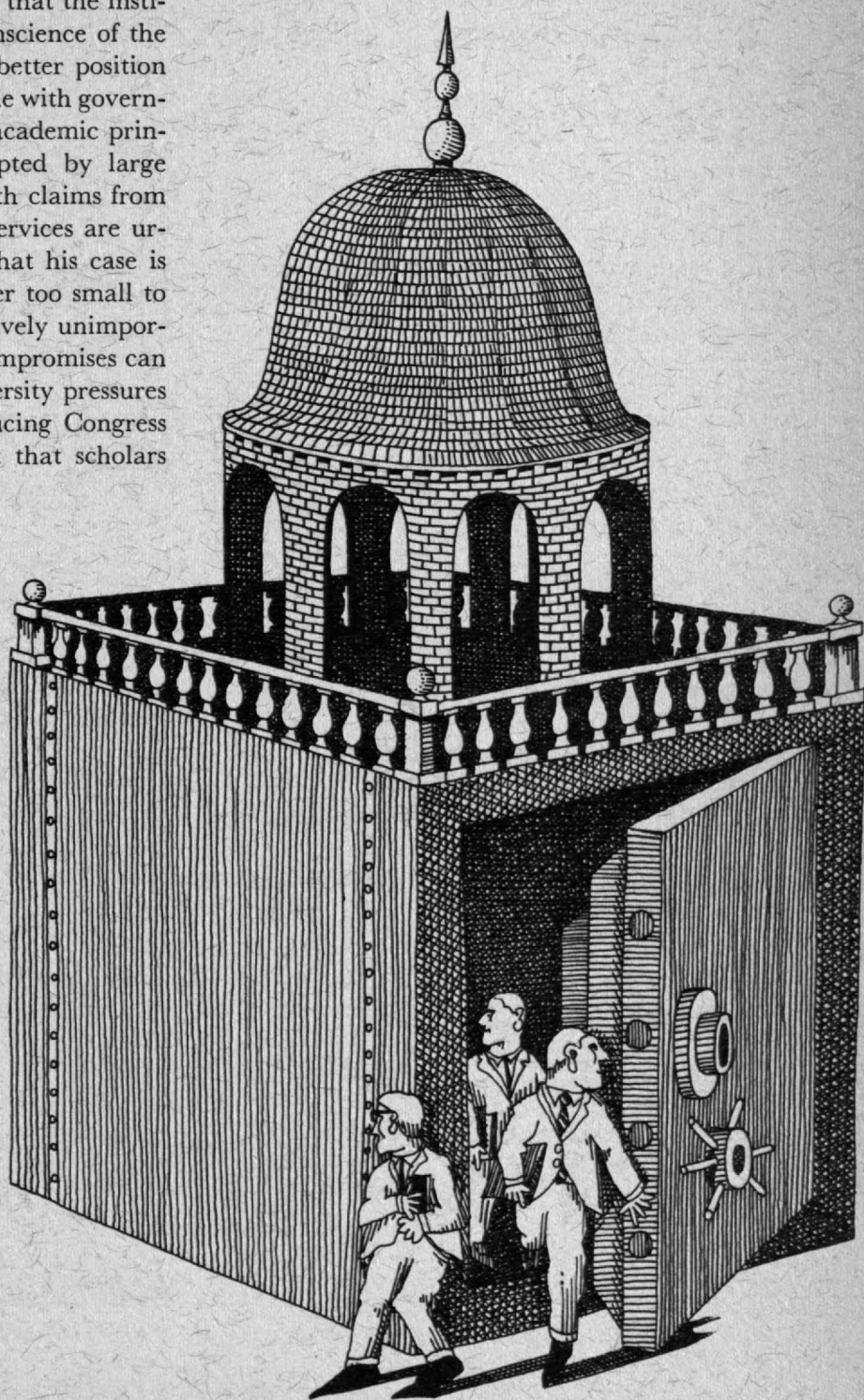
The distinction between the responsibilities of the university and those of the individual scholar is an important one in many areas of behavior. The university should not, for example, engage in support of political candidates, but scholars must of course be free to do so as citizens. However, the

distinction breaks down when questions of academic principle are at stake. I do not believe that persons who do not maintain in their scholarly activities the essential principles of academic integrity have any place on the campus. So far as the university environment is concerned, a campus full of combination safes individually operated or peopled by professors who disappear to off-campus hideaways to do their classified work surely provides no better atmosphere of free and unrestricted inquiry than one with several safes kept together in a room under university auspices.

A more important consideration is that the institution as the embodiment of the conscience of the academic community is in a much better position than the individual scholar to do battle with government agencies for the protection of academic principles. The individual scholar tempted by large financial support and confronted with claims from high levels of government that his services are urgently required can be persuaded that his case is exceptional and his bargaining power too small to resist compromises which seem relatively unimportant. But a large number of small compromises can erode principles quite rapidly. University pressures recently played a large part in inducing Congress to abandon a senseless requirement that scholars

going abroad on unclassified university contracts with AID must be given security clearance.

IF, AS I BELIEVE, none of these rules gives us any satisfactory guidance as to how to steer our course between academic integrity and the requirements for serving the national interest or offers any real protection of university reputations, what rules are appropriate? It is part of the essence of this com-



plex problem that there are probably no rules which can be mechanically applied to all situations, and that reliance must ultimately be put mainly on the judgment and integrity of the parties involved. Nonetheless, there are some guidelines for both university and government behavior which I would put on the table as an agenda for discussion.

1. Universities and scholars attached thereto should reaffirm their determination to engage only in activities whose purposes they can and do make fully public. Such reaffirmation should not be necessary, but in view of the widespread if unfounded suspicion of motives it may serve a useful purpose. This should be accompanied by a restatement of our philosophy of an open society and of the validity of public scholarly inquiry into social and political behavior.

2. Universities and scholars attached to them should as a rule accept research projects in the social sciences only when the principal findings of the research can be published together with the major evidence in support of them. The main guarantee of the objectivity and integrity of research results is to subject them to the scrutiny and criticism of the entire academic community. Under this rule scholars could receive and examine classified material and where necessary produce for government policy makers annexes or appendices analyzing the relationship of classified to open sources or dealing with sensitive policy issues. But the publication of the main product is the most important way in which the integrity of the research can be demonstrated.

3. Universities and university scholars should accept no contracts with clients public or private which give the client any control over the substance of the conclusions of the research. Government agencies for their part should reaffirm the principle that they are in no way responsible for the conduct or conclusions of researchers whose activities they finance. If this rule is insisted upon by universities and comes to be widely accepted as normal by government, many of the fears of bureaucrats of being identified with research conclusions for which they should not accept responsibility will be eliminated. There will still be valid reasons for not making public all policy advice from scholarly sources.

But the independence of research conclusions must be inviolate.

4. To permit critics to check for the presence of sponsor-inspired bias, universities and scholars should follow the practice of accepting only contracts which permit them to reveal fully the sources of funds supporting their research.

5. Finally, to avoid implicit, as opposed to explicit, control, university research organizations should avoid becoming dependent for too large a fraction of their support on any one government agency or indeed any one source of funds, public or private.

This still leaves us with the problem of the university image at home and abroad. Where suspicions are deepseated and malicious, good behavior will not insure a clean reputation. The discussion and adoption of some such code as that sketched out above would go a long way toward reassuring the world that the American academic community was respecting its obligations.

BUT IN ADDITION the allaying of suspicion requires major restructuring of the way in which government provides support for research and especially social science research in the foreign policy field. The research and analysis aspects of government intelligence must be more sharply separated than they now are from the clandestine aspects. The Congress must make available funds for basic social science research in much more ample quantity through agencies other than the Department of Defense, which now carries most of the load. The code for universities must be accompanied by a parallel code for government contracting agencies which will inhibit the proclivities of overzealous bureaucrats. The government must emphasize abroad that U.S. scholars and institutions are independent even when publicly financed and that government accepts no responsibility for their behavior or their conclusions. If all these things are done, the scholar will be able with a clearer conscience to discharge his obligations to his profession and his government.

The end of Federal support would bring serious adversity to American campuses, including especially M.I.T.'s. But it would be an unthinkable abandonment of a priceless partnership.

The Federal Presence at M.I.T.

By Jerome B. Wiesner

JUST AS IT DOES on most major campuses in the United States, the Federal government plays an important role at M.I.T. Indeed, generous Federal support has given M.I.T. some very special opportunities, as well as unique responsibilities and problems. Without it, the Institute today would be a very different place.

Has this increasing involvement of the Federal government in the Institute's affairs jeopardized our quality? Has it in any important degree lessened our ability to make our own decisions and seek our own course? The answer to the first of these questions is easy. I am convinced that Federal support has been, in fact, a positive factor of very great

significance in our growing effectiveness in teaching, in research and in service on some of the greatest imperatives of the nation and all its people.

The second question is harder to assess. Clearly, Federal funds have to some degree affected the freedom for decision-making by the Faculty, the administration and possibly even the students, but this has occurred in an environment of vastly broadened opportunities made possible by the Federal support. Therefore, the realizable choices are undoubtedly much greater than they would be if the Institute was totally dependent upon the support it could engender from private sources. Sometimes governmental decisions can have a



To his duties as Provost of M.I.T., Jerome B. Wiesner brings experience as scientist and statesman which is unique in America.

He has been a member of the President's Science Advisory Committee since 1957, was staff director of the American delegation to the Geneva Conference for the Prevention of Surprise Attack in 1958, was named by President Kennedy to be his Special Assistant for Science and Technology in 1961, and became director of the Office of Science and Technology when that agency was established in 1962.

Dr. Wiesner studied at the University of Michigan, came to the M.I.T. Radiation Laboratory before World War II, and was director of the Research Laboratory of Electronics from 1952 to 1961.

In Cambridge since leaving his Washington assignment in 1964, Dr. Wiesner has been dean of the School of Science (1964-1966) and provost, the Institute's senior academic officer. He holds the distinguished title of Institute Professor on the M.I.T. Faculty.

Federal funds may have somewhat limited the freedom of decision-making by faculty and students. But they have vastly broadened the range of choices

troublesome impact on the Institute's operations—as, for example, when cost-sharing requirements on research projects suddenly necessitated a quick revision of bookkeeping methods and the diversion of substantial amounts of the Institute's funds from other uses. But I believe that the improvement in quality and scope made possible by government support has in the past been an extremely constructive factor. There are currently, unfortunately, many trends in government support of university activities which could seriously reduce the effectiveness of the activities which have been made possible.

ONE TYPE OF Federal involvement at M.I.T. is organized so independently that discussion of it can be relatively simple. This is the Federal support of two large mission-oriented laboratories of which M.I.T. has been entrusted with management—the Instrumentation Laboratory and the Lincoln Laboratory. In each case we determined that the integration of these enterprises into the traditional academic structure of M.I.T. would be unwise; they were heavily involved in classified research, at least at the times of their founding, and they promised to be large operations which would distort the academic character of the Institute if integrated into it.

These two laboratories were created and are operated to meet vital national needs in technical fields in which M.I.T. Faculty members could give unmatched leadership. Because of their size and the urgent nature of the problems they were to engage, they could not function as traditional academic laboratories and so were organized separate from the campus activities.

Any applied science laboratory working at the frontiers of technology must have a major component of basic research associated with it, to make sure that the laboratory and its people understand and exploit the fundamentals that underlie their work and to attract to the laboratory staff members who are competent to participate in challenging research. As a result, for example, Lincoln Laboratory has some of the most distinguished work that can be found anywhere in solid-state physics, computers, psychology, and radio astronomy. And some of the very best facilities—better than we have on the M.I.T. campus, in many instances.

Faculty members have been involved in both these laboratories since the beginning, working as members of the laboratories' staffs or as consultants. Because of the special facilities and interests of these laboratories, a number of graduate students and Faculty do their research there; and a number of these graduate students have stayed on as professional staff. They pay a price, of course, because of the distance from the campus, the security clearances sometimes required, and the resulting communications problems. But this is not too heavy a price, and some of us think that M.I.T. Faculty and students take too little advantage of the staff and facilities that exist for their potential benefit at the Lincoln and Instrumentation Laboratories.

THE QUESTION of government involvement in the more traditional academic undertakings at M.I.T. is far more complicated, since it takes so many forms.

In 1964, \$1,896,684 of fellowship aid to M.I.T. graduate students came from Federal government

sources, nearly 45 per cent of the total of graduate fellowship aid at M.I.T. In addition, 1,227 students benefited in 1965-1966 from loans under the National Defense Student Loan Program, a total of \$824,425. Funds allocated to this program in 1966-1967 have been cut to just over \$675,000, so more of our own Technology Loan Fund resources must be used this year if we are to maintain our present standards of student aid.

The total of federally sponsored research administered under the Division of Sponsored Research in 1965-1966 was \$41,130,000 (91 per cent of the total of sponsored research). This total of Federal research expenditures is 55 per cent of M.I.T.'s total educational, general, and research expenses (not including Instrumentation and Lincoln Laboratories) for the year. In all, 1,755 members of the academic staff (Faculty members, students and academic research staff) were participating last year in sponsored research projects administered under the Division of Sponsored Research, and 90 per cent of these projects were under Federal sponsorship.

Federal involvement in the development of M.I.T.'s teaching and research facilities has reached major proportions and promises to expand further in the next few years. In 1965-1966 the Federal government provided M.I.T. \$1,199,000 for buildings and facilities; most of these grants were on a matching basis, and M.I.T. has provided \$1,628,000 for these projects. The National Science Foundation has made a planning grant for CAMROC, a large radio astronomy observatory being planned by Harvard, the Smithsonian Astrophysical Laboratory and M.I.T., including the Lincoln Laboratory. Negotiations with the Atomic Energy Commission for a linear accelerator have progressed to the point of selecting a site in Essex County. A planning

grant for a graduate research facility in chemistry is expected from the National Science Foundation. The Office of Education is bearing one-third of the cost of the building for the Center for Advanced Engineering Study, now under construction, under a Higher Education Facilities Act grant. And planned renovation of the Engineering Library will be partially supported by a similar grant.

Funds provided by the National Science Foundation have augmented M.I.T. resources supporting the development of the new undergraduate physics course in the Education Research and Development Center, and that agency currently supports the broadened activities of that important educational program.

In sum, the influence of the Federal government is pervasive on the M.I.T. campus. Its summary effect in the past decade has been to strengthen the Institute immeasurably. As Julius A. Stratton, '23, wrote to Congressman Henry S. Reuss last year, in response to questions of a House subcommittee on Federal research and technical programs, "the quality of undergraduate as well as graduate education at M.I.T. has never been higher, and the character of this education is strengthened and enhanced by the research environment of the Institute."

FEDERAL SUPPORT at M.I.T. is indeed important in the over-all excellence of the Institute. Any university's programs in research are an essential aspect of its work in teaching and this is especially true if, as at M.I.T., the Faculty makes sincere and successful efforts to involve both undergraduate and graduate students in ongoing research. In fact, an effective graduate educational program is impossible without a high level of research activity. We are convinced that a total involvement in both the learning and teaching process is the special quality which should distinguish the modern scientific university.

The nature of Federal funding may have denied some of these benefits on some occasions. The traditional research contract system, whose objective is the support of individual scholars on specific projects, is literally an agreement to do certain research in consideration of certain payments. It is motivated by the government's dual interest in stimulating the flow of new information and preparing additional qualified engineers and scientists. In practice, this type of specific-purpose

contracting has provided a basis for charges of opportunism on some campuses, on occasion has contributed to the directing of proposals to fields which would otherwise not be considered for support by the institutions, and in some instances may have made more difficult the appropriate involvement of students.

The use of block grants or contracts made to a department or laboratory for research in some specified area of science or engineering is an alternative which provides protection from some of these hazards. Under this arrangement the university itself is entrusted with the responsibility of administering the funds, the individual Faculty member is relieved of many administrative burdens and has an increased opportunity to develop the intellectual and organizational environment best adapted to his own and his students' interests and gifts. Such "block" grants or contracts now cover a large portion of the work of M.I.T.'s Research Laboratory of Electronics (for whose support this kind of contract was pioneered a decade ago), the Laboratory for Nuclear Science, and the Center for Space Research. These examples have demonstrated in practice that there are mechanisms for increasing institutional responsibility for and selection and control of the over-all research effort without sacrificing the environment needed for individual creativity.

Federal funds for research are very largely devoted to scientific and technological problems. Indeed, some people have concluded that the Federal government's support of higher education is so imbalanced in favor of the hard science departments that the social sciences and humanities are dangerously neglected. This emphasis has its origins in the relation of these programs to national defense and health needs, and it is surely true that science has a very much higher social priority than it had before World War II. The Federal government is now increasing its role in supporting education in the social sciences and humanities, but it is worth emphasizing that the availability of Federal funds for scientific research has probably made it possible for all institutions—M.I.T. among them—to use a greater portion of their own funds in nonscientific fields. Yet more help is needed. The example of the sciences, Dr. Stratton told Congressman Reuss, "ought to set new measures and standards of public and private support in every field of learning."

One way to help maintain M.I.T.'s independence despite an extensive involvement in Federal programs is to be sure that the Federal government

pays the *full* cost of work undertaken in its behalf. This is not a minor, or simple, problem. In 1965-1966 M.I.T. received slightly more than \$14 million in research grants from the National Science Foundation and the National Institutes of Health. These are programs which reserve for M.I.T. and its Faculty decisions on the specific projects to be supported, and as such they are especially important to us. But in the appropriations bills authorizing such support in fiscal 1966, Congress in effect required that every recipient of a research grant share in the cost of the work performed under that grant in more than a token amount. Thus the acceptance of grants of this kind requires commitment by us of institutional funds which ought to be freely available for purposes entirely of our own choosing. The Institute, Dr. Stratton told Congressman Reuss, "accords the highest priority" to achieving the full reimbursement of indirect costs of Federal research activities.

M.I.T. receives substantial bequests and gifts from individuals, corporations and foundations, and the Institute is largely dependent on these sources—and on tuition—for academic functions—Faculty salaries, classroom and teaching laboratories space, student housing and undergraduate scholarships. M.I.T. also benefits immeasurably from a research endowment fund established through the generosity of the late Alfred P. Sloan, Jr., '95. This fund is turning out to be extremely useful for obtaining specialized equipment and funding new research programs or research activities for which alternative financing cannot be obtained.

SOME FEDERAL RESEARCH needs involve special commitments which are contrary to academic traditions, and these raise special problems for universities. Among these questions are problems of secrecy and those involving moral issues such as work related to biological or nuclear warfare.

The Faculty and administration of M.I.T. share with all academic institutions around the world the desire for maximum—in fact, complete—freedom for exchange of information on a world wide basis. This ideal is sometimes in conflict with the needs of our own national security and survival. Some of the most interesting and advanced technological problems stem unfortunately from the need to defend ourselves, and M.I.T. has been one of the major contributors among the academic institutions to the technology that helps to assure our national security.

Since there are technological problems which can only be worked on in secret by people who have been cleared to deal with them, we have to make a choice. Either we have enclaves of secret research on or near to the campus; or we bypass interesting and vital areas of modern technology. If we refuse to deal with classified areas, we may do so at the expense of students who want to develop their skills in these fields, and we do so at the risk of depriving the country of the contributions to its security which might result from the talents of our Faculty who are specialists on these matters and our students who may learn about them. So we are confronted with balancing the price we pay for making some parts of the institution a closed society against the contribution we can make to our nation's security.

Our policy at M.I.T. is to strive always for the maximum of free, open, uninhibited discussion—in other words, for unclassified research. But we rec-

ognize always that we should be willing to make exceptions on two grounds: that we have a unique capability to contribute to the national defense and are convinced that our contribution may indeed be vitally significant; and that there is within a particular proposal something of technological or scientific interest that in itself justifies our work in a classified area.

Classified research and theses are not undertaken on the M.I.T. campus without approval following a critical examination of each proposal individually in the light of the issues which I have listed. This examination is conducted by the departments involved, the Faculty Committee on Educational Policy, the Committee on Graduate School Policy, and the Academic Council.

This policy has been in effect at M.I.T. for at least the last 20 years, though it has only recently been put on paper and endorsed by the Faculty. The policy has, of course, been interpreted differ-

The following is the text of a policy statement on classified research drafted by the M.I.T. Academic Council and endorsed by the Faculty on December 21, 1966.

This statement is written to clarify M.I.T. policy and practices regarding governmentally classified research activities, including classified theses.

M.I.T. affirms that the encouragement of research and inquiry into intellectual areas of great promise is one of the most basic obligations to its faculty, to its students, and to society at large. It affirms the profound merits of a policy of open research and free interchange of information among scholars, as essential to this responsibility.

In the vast majority of research projects, the encouragement of inquiry wherever the research might lead is not in conflict with the principle of freedom of inquiry and open exchange of knowledge. However, M.I.T. is an institution that plays a unique role in important areas of science and technology that are of great concern to the Nation. It recognizes that in a very few cases the pursuit of knowledge may require access to data or literature of a classified nature, or yields results whose immediate distribution would not be in the best interests of society. It affirms,

therefore, that such activities are undertaken only when, after weighing the advantages and disadvantages for the academic program and for the Nation, they are judged to be highly constructive. Since the implementation of classified research has some aspects which are detrimental to the academic environment of the Institute, it is essential that each project be reviewed and acted upon in the light of its impact on the Institute as a whole.

It is the policy of the Institute, therefore, that every research project within the academic structure of M.I.T. (excluding Lincoln Laboratory and the Instrumentation Laboratory) which requires a classification on the research process or on the publication of results receive the prior approval of the President or Provost, who shall seek the advice of the Committee on Educational Policy in cases that involve modification of the existing policy and will inform the Committee of all approvals.

Individual classified theses to be undertaken by undergraduate or graduate students must be approved by the Committee on Graduate School Policy before the work is begun.

ently at different times during this period. During World War II, the intense "cold war" confrontations, and the Korean conflict we performed more classified research because it was considered necessary in the national interest. Today, however, there is essentially no classified research activity on the campus. Classified research is under way in the two off-campus laboratories, Instrumentation Laboratory and Lincoln Laboratory, though in both cases there is a great deal of unclassified research as well. Some Faculty and graduate students are working in these laboratories, and there is a very small amount of classified work in the Electronic Systems Laboratory.

Research which bears upon such moral considerations as biological warfare is subject to the same kind of scrutiny, and on the same general bases. None is now under way on the campus, and it seems unlikely—given a continuation of present world conditions and attitudes—that our Faculty will propose work in this field or that we shall accept it.

WHAT OF THE FUTURE? Does M.I.T.'s heavy commitment to Federal support mean that the present character and stature of the Institute are in fact dependent upon its continuance?

Obviously, if the Federal government really halted its support of research and education throughout the U.S. there would be very serious trouble—at M.I.T. and at almost every other major educational institution. This is not only because of the fairly obvious direct repercussions. It is important to point out, too, that we would have the same problems that occur in any family subjected to a major cut in income. The standard of living has to be adjusted downward. M.I.T. now has a business office large enough to keep track of all our business; we have bigger library facilities and bigger computer facilities than we would need or could afford without our federally sponsored research, and our educational effort benefits from them. It is true that the government itself has recognized the nature of the hazards which Federal research imposes upon our financial structure, and, for example, in the case of Lincoln Laboratory an adequate termination reserve has been provided. Nevertheless, a sudden change in the dimensions of our research support would require a traumatic readjustment which would inevitably affect every aspect of the Institute and its educational power.

But such a situation would be literally an unthinkable reversal of a Federal policy which has proved its worth beyond any possible doubt to the country and to its educational institutions during the post-World-War-II decade. This kind of total policy shift could in reality only come in a time of such extreme national emergency that the institutions' problems would be very small compared with the nation's total predicament.

Termination of our Federal support may be unthinkable, but it is true that much less substantial changes in the policies within which the Federal government supports research at educational institutions can be very serious to many universities and programs—especially those at such large, private schools as M.I.T., Stanford, Caltech, Harvard and Columbia. Some effects are even now being felt, and they are working hardship which we believe is unnecessary upon M.I.T. and its Faculty and students and detracting from the effectiveness of the educational and research programs which Federal grants are designed to support. This is in a sense a painful period for universities with substantial Federal commitments.

One of these changes is the increasing restriction on the part of Federal agencies on how research funds are used, on what can and cannot be done in the way of purchasing, traveling, hiring, and many other activities in support of a research mission. As one example, the combining of funds from two separate agencies in support of a single project, which used to be easy to manage, is now more difficult.

Another of these trends is the decreasing support which is now available to any one institution. This is the result of the Viet Nam war and of the fact that more institutions are being supported. The decision—a proper decision, I think—was made a few years ago to use Federal funds to broaden the base of research in this country, to build up the quality of some universities in areas of the country which do not have strong academic centers. The result in practice is a kind of ambiguous limitation on any one institution's research effort in the interest of spreading the Federal government's funding to more schools on a broader geographical basis. And this program of extending our centers of excellence now has the effect of emphasizing criteria other than simply the excellence of the research activities being supported.

A similar problem is involved in the effort to broaden the use of Federal fellowship funds. The original Federal fellowship program, that of the National Science Foundation, provided that fellow-

ship recipients were free to use their grants at the institutions of their choice. As a result, the NSF fellows have tended to concentrate at the most prestigious institutions; Cambridge, with Harvard and M.I.T., has in recent years typically drawn over 20 per cent of the NSF fellows and the San Francisco area (Stanford and the University of California at Berkeley) 15 per cent. Subsequent legislation establishing other graduate student aid programs has included provisions directed toward assuring greater geographic distribution of graduate student strength. But this is not as simple as it sounds; the supply of talent for a first-rank faculty is limited, and the creation of a center of excellence in graduate work requires not one but a substantial number of such teachers to achieve the "critical size" necessary for mutual interaction and stimulation. The supply of top-quality graduate students is also limited, and the quality of a given graduate program depends upon the presence of at least a few of this very select company.

The result of these two trends, taken together, is that institutions such as M.I.T. are being less well funded, with more restrictions; and we are having to wait longer to know whether we are going to be funded. Contracts for research, which used to be for several years, are sometimes now for only one year, so that a member of the faculty and his graduate students live in a period of hope and uncertainty a good part of the year, unable, for instance, to plan properly or to hire the help they need.

The pain caused by these two factors to ongoing research activities is not because they have been cut back very seriously, because there have not been significant cut-backs. (A few fellowship funds are actually contracting; NASA, for example, has been forced to cut back on its fellowship program, so that the number of students supported here at M.I.T. by NASA fellowships next year will be smaller.) The pain comes because the kind of normal growth that any healthy scientific enterprise needs is not being permitted. In the past, this has amounted to a growth of at least 10 per cent annually—perhaps 15 per cent.

The Department of Defense has this year begun to make available new money from the Congress to fund new interdisciplinary science research laboratories, of which the Research Laboratory of Electronics at M.I.T. was an early successful example, and academic institutions are being encouraged to start a number of these. If these are started at the level of \$20 million annually, they have a built-in need for increases of \$3 million a year hereafter. Meanwhile, the fact of the matter is that growth in the

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research. Now the nation
is sophisticated enough
to face the facts and
meet the needs with candor*

nine or 10 existing joint electronic programs in the strongest American universities, which have over the years contributed in a very major way to the strength of the nation's physics, electronics and other sciences, has been held down, and these laboratories have been deprived of the funds they need for healthy development. The directors of these laboratories, and the faculties working in them, have had to do all kinds of special tricks to keep going. If some fraction of the new money appropriated by the Congress had been available to rehabilitate the existing laboratories, and if some fraction of it had been held to meet the growth potential of these and of the new laboratories, I believe the research program of the country would be better off.

There is real danger that we will build up a number of new institutions which will, I think, never be as productive as the big centers. There is also a danger that the quality of the big centers will not be as high as it would otherwise have been. And I think one has to ask whether we want a homogenized national program, whether the new result will not be a major loss to the country.

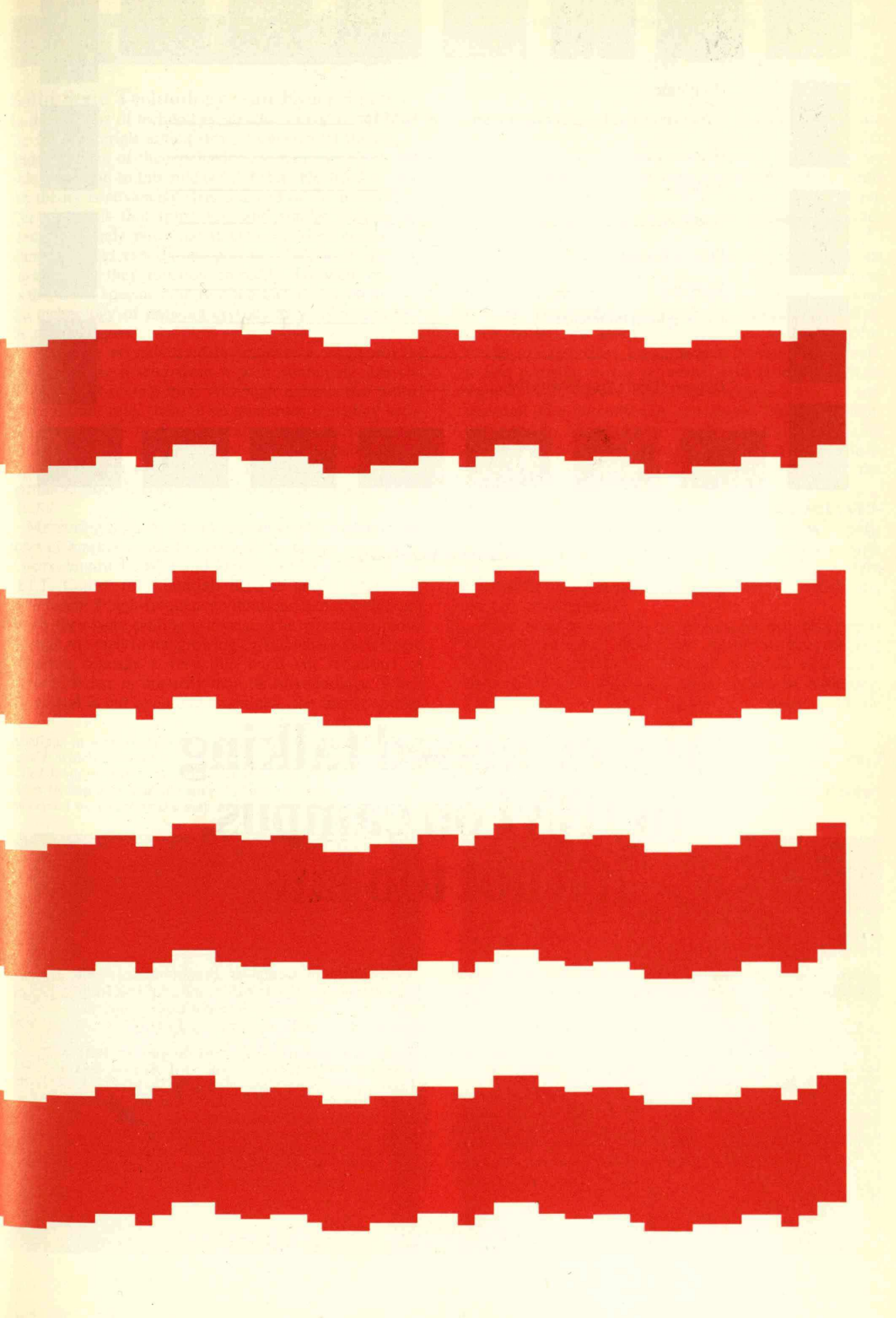
All of these things risk less effective use of the research funds at a time when the funds themselves are being restricted.

Some of these trends are an inevitable and natural consequence of the aging of scientific support programs. As members of Congress examine the Federal programs and uncover minor abuses (of which there have been some and always probably will be), new restrictions are suggested. Taken individually, none of the restrictions looks very serious. But when they impose themselves collectively upon a research scientist in a university they can be serious indeed—and especially so because the scientist stayed in the university environment in order to assure for himself the kind of intellectual freedom to which American universities are traditionally dedicated. I think that periodically the Congress ought to complain about the restrictions, too, and set the clock back to zero so that we can start over. Otherwise we are likely to end up with an overwhelming set of regulations and a bureaucracy which will make it extremely difficult for an innovative and free-moving science program to exist. I do believe that most of the safeguards we need could be assured without

imposing so many serious restrictions and so much red tape. And I do believe that the Congress and the executive branch of the government should take a serious look at whether the way we now manage our scientific enterprise is not causing it to be less efficient and less effective than it should be.

HAVE THE FEDERAL PROGRAMS affected the balance of research and educational programs at M.I.T.? Yes, probably, because things do grow faster in those areas where funds are relatively easy to get. But one can argue about whether this is good or bad; for this kind of selective funding is one way of obtaining a response from the academic community to a national need. I believe that in the past, Federal funding has been a reflection of serious national problems. One can now obtain money relatively easily for research in health-related fields, for transportation studies or, now, for pollution research; but these are big national problems, and attracting faculty and students into these areas, and obtaining new research information and qualified new workers in them, seems to me a desirable thing. But at the same time the Federal government should perhaps make sure that faculty who have interest in fields—such as astronomy—which do not happen to be related to immediate national needs are not neglected. For it is indeed important to maintain a balance in the scientific community.

The nation's involvement in colleges and universities was originally motivated by national security considerations. As security problems have become less dominant, the nation has become interested in Federal support as it contributes to the continuing increase of productivity and the solution of specific national problems. We have more and more been moving toward the support of research because we think it is healthy for the country. We are also beginning to recognize that for a long time we have been paying for education under the guise of research. We should recognize this continuing need and meet it more rationally. This is a much more diffused kind of motivation, and it demands a more sophisticated country—which I think is what the United States is now becoming.



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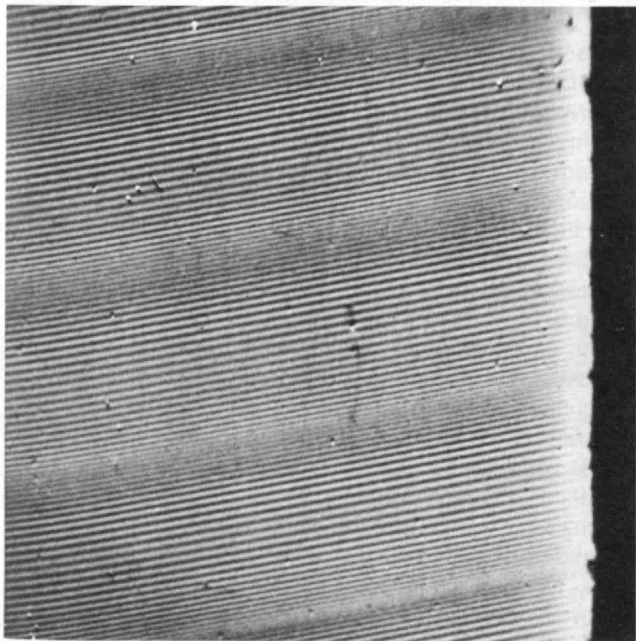
Solid State Technology—an Exact Science?

In most forms of technology, practical expertise in dealing with materials anticipates a fundamental theoretical understanding of their behavior by many years. A notable exception to this rule is solid state electronics: here the theory is advancing strides ahead of the technology. The reason is that transistors and similar devices demand extremely pure materials and perfect crystals; in some instances exactly one part in a billion of impurity ensures that they function correctly. Growing crystals to this exact specification is still a hit or miss affair. But the technology of growing crystals may soon turn into an exact science.

The single crystals used in transistors are grown by slowly pulling a seed from a melt containing just the right amount of impurity. Although crystals are pulled at a constant rate, there is no guarantee that they actually grow at this rate on the microscopic scale, or even that different parts of the crystal are growing at the same rate. This microscopic rate is of paramount importance, since it controls the microcomposition of the crystal.

Measuring the real rate of growth would require some form of marker inside the crystal. To provide this, Professors August F. Witt and Harry C. Gatos, '50, in the M.I.T. Center for Materials Science and Engineering, have beamed high-frequency vibrations into a melt from which they were pulling a crystal. The vibrations move through the melt to the growing crystal where each single vibration deposits a very thin band (or striation) of material richer in impurity than its surroundings. When the crystal is cut open and examined, the bands appear

Striations in semiconductor crystal measure microscopic rates at which different parts of the crystal are growing, as it is pulled from its melt. The striations, bands of material richer in impurity than the surroundings, are introduced into the crystal by vibrating the melt at high frequency.



clearly, and, like tree rings, they form a very readable time-scale of growth.

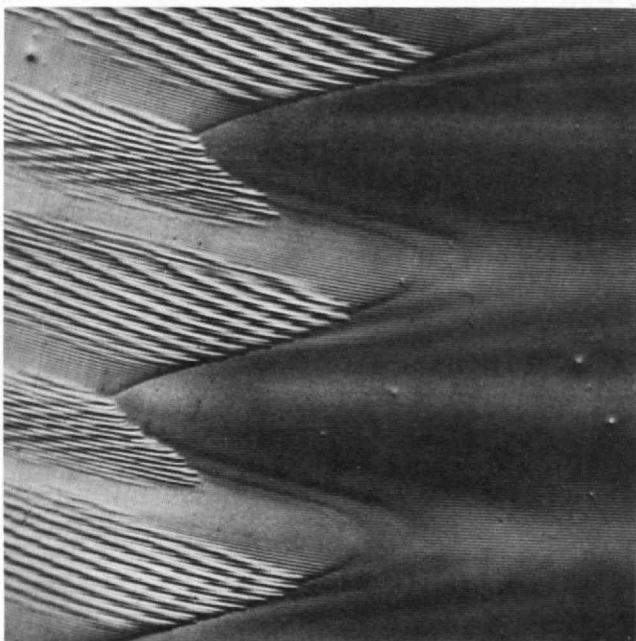
Using optical microscopes, Professors Witt and Gatos have detected striations as little as 0.2 microns apart, corresponding to a time interval of a twentieth of a second. They see no reason why the method should not extend to higher frequencies, to detect even smaller separations using electron microscopy. Although they have only worked so far with crystals of indium antimonide and germanium, the technique should apply to all semiconducting crystals, and possibly to other types of materials.

Although in the very early stages, the investigations have already shown that rates of growth and concentrations of impurities vary dramatically throughout most crystals. The method shows exactly (through the reference marks) the effect of growth rate on the concentration of impurities throughout a crystal; as a result, it also provides a way to study other processes affecting the concentration. And once materials scientists understand why impurities do not spread evenly throughout crystals, they will be on the verge of producing more exact and homogeneous crystals—an accomplishment which will provoke a minor revolution in the transistor industry.

For the present, the method puts the science of solidification onto a quantitative basis, as long as experimenters ensure that the vibrations do not interfere with the growth of the crystal. And it is also bringing to light interesting interference patterns in crystals which are, as yet, unexplained.

One amusing facet of the investigation is that previous workers have done their utmost to prevent any vibration in growing crystals, in the belief that vibrations induce the disastrous effect known as 'twinning' (in which a large band of atoms in a crystal suddenly

Since the time interval between the bands is constant, their separation gives a clear indication of the growth rate throughout the crystal. Photo left shows the simple effect of growth rate on the concentration of impurities; photo right shows more complex, and as yet unexplained, interference effects.



Trend of Affairs

changes its orientation). But Professors Witt and Gatos have found that with the frequencies they have been using, twinning is even less likely than in the absence of vibrations. Thus, in addition to providing materials scientists with a powerful new quantitative tool, their work introduces a new environment for more reliable growing of crystals. □

Engineers and the Information Explosion

The basic mission of engineering societies is to disseminate and preserve professional knowledge. This they largely do through publications, which in 1966 accounted for one-half the total combined budgets of 18 leading engineering societies, or \$14 million. In January, Engineers Joint Council sponsored a two-day conference to identify new ways in which the societies may enhance their services and streamline their operations in this major field of their endeavors.

The society literature programs, in the view of EJC President Clarence H. Linder, contribute importantly to keeping engineers professionally aware and effective, and the conference was intended to assist publications executives in the societies to assess their publications efforts. Two over-all areas were explored—literature programs and management, and relationships between computer-based information systems and those parts of society publications programs related to technical information.

Some of the speakers identified important literature services that the societies ought to provide: missing from many of their programs are state-of-the-art papers, bibliographies for self-study reading programs, and coverage of national issues in science and technology. Ernst Weber, President of the Polytechnic Institute of Brooklyn, cited the success of *Scientific American* and *International Science and Technology* as evidence of the demand for state-of-the-art articles reviewing the leading edges of specific technical fields.

Dael Wolfle, executive officer of the American Association for the Advancement of Science and publisher of *Science* magazine, made a plea for a program to keep engineers abreast of governmental, political, economic, and social events and ideas that relate to science and technology. "No engineering journal," Wolfle said, "is adequately interpreting for its readers the social and political climate and trends within which they work."

Because the composition of a society's membership is key to the meaningful planning of its literature programs, both Donald G. Fink, '33, IEEE general manager, and Allan R. Putnam, ASM director, recommended that each society measure the composition of its membership. Said Fink, who proposed readership surveys as a measuring tool, "The opinion of society management concerning the needs of the profession they serve is almost always out of date." Membership surveys, Putnam said, reveal member interests that are not being served or are being "over-served"; they give business staff deeper insight into the market available to advertisers; and they may be used for membership recruitment efforts.

Once a society's publication program is well con-

"It is one of the most noble endeavors of mankind to discover curious facts, to relate the apparently unrelated, to build abstract edifices of theory, to probe the universe as astronomers do, and to probe the smallest particles as the high-energy physicists do. Basic science creates a beauty, an understanding and harmony. . . . and it provides increasingly the tools without which entrepreneurs and inventors and innovators would be completely helpless and without effect."—H. B. G. CASIMIR, Director of Research, Philips' Industries (Eindhoven, the Netherlands), at the National Bureau of Standards' Symposium on Technology and World Trade, November, 1966.

ceived in terms of its membership, the society should next assure strong and dynamic editorship. Fink described "cardinal sins" that can occur when the editorial function is ignored or subordinated:

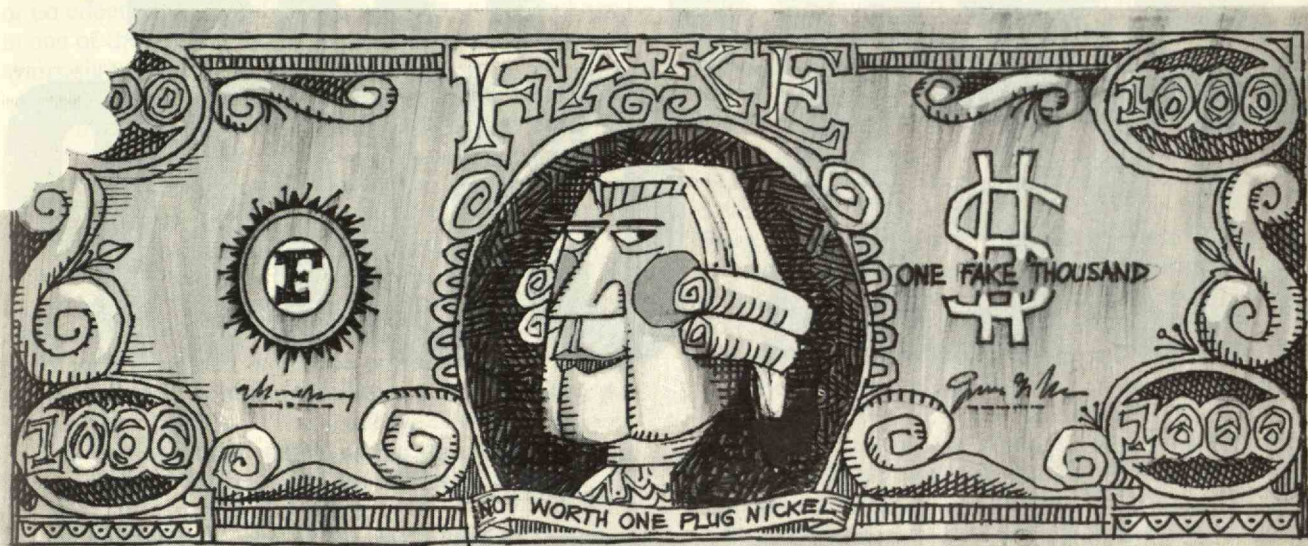
- Previously published material gets republished.
- Conference publications are automatically published without review or editing.
- Material is published to gratify a sense of organizational or personal prestige.

"Too often," Fink explained, "a committee—rather than an editor—determines what should be published in our journals." Commercial publishers learned long ago, he said, that "there is no substitute for a great editor, supported by an able staff, who truly directs his publication."

Unfortunately, according to O. B. Schier, 2d, executive director of the American Society of Mechanical Engineers, a study of 18 leading engineering societies has shown that many are facing a financial squeeze which is affecting their ability to innovate. Costs of printing and paper, and the lengths of papers, are rising, while advertising revenue is falling. As a result, seven engineering societies have followed the lead of the scientific societies and are resorting to page charges for papers published in their transactions. Schier forecast greater circulation of microfilm, abstracts, and preprints to individuals in lieu of archival publications, such as transactions, journals, and proceedings. The distribution of these latter is likely to be confined to subscribers and repositories in the future. Imminent advances in printing technology are also likely to bring down costs, he said. Other alternatives for meeting financial ends, mentioned by S. W. Herwald, Westinghouse Vice-president, include consolidation of different publications, dues increases, publication of fewer pages, change from letterpress to offset printing, and increases in advertising revenue.

The conference also looked into the whole rationale of technical information. Derek J. de Solla Price, history of science professor at Yale University, charged that most of it exists for "accidental reasons" or because some people think that it should exist, rather than because of any need or use. No one really knows, he added, what the engineer wants to read or why the "enormous mass" of public literature satisfies so little of his appetite. Said Price, a typical engineering question is: "What is the torsional breaking strength of the human ankle?" And for this kind of information, he concluded, data banks

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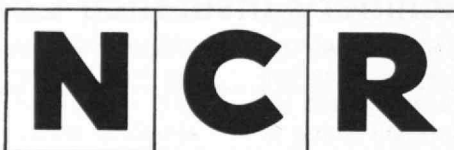
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are needed, not archives.

The director for technical information in the Department of Defense, Walter Carlson, agreed with Price that the engineer primarily wants specific information to help him with on-the-job problems. Reviewing DoD studies on how defense industry engineers use technical information, he reported: "We find that engineers make little or no effective use of information that is . . . packaged in one of the general media such as technical journals or symposium papers."

Fink also commented on the random manner in which technical information is released: "The plain fact is that the great mass of available technical material is too often wasted because the man who can use a particular paper in his work either does not know it exists or has too small a chance of finding it when he needs it."

All these comments, of course, are variations on the theme of the "information explosion" and the often-expressed need either to muffle it or manage it. (Undoubtedly, some mix would be optimal.) NASA's deputy director for technology utilization, Melvin Day, put the problem this way: "The challenge is to bring all useful information under control and to process it in such a fashion that only the nuggets are delivered to the user at the time he wants and needs it."

One striking revelation of the conference, in fact, was the identification of the challenge awaiting the societies in determining how their technical information programs may be linked to the use of computer-based information systems now emerging. Indeed, the most profound meaning of the conference was that the societies should rethink their entire scope of publications and repackage them according to current needs—on the one hand, general literature for professional awareness, and, on the other hand, specialized engineering information and data for inclusion in automated information systems.—Stanley Klein, '58. □

"The Ecology of Education"

Educational Services Incorporated, spawned at M.I.T. in the Physical Science Study Committee in the late 1950's, has been merged with the Institute for Educational Innovation to form the Education Development Center, a regional laboratory which will continue the activities of both its constituent groups in studying national and regional problems in education and its public support and involvement.

Franklin A. Lindsay, President of Itek Corporation, will be chairman of the new organization. "It will work to strengthen education in New England and elsewhere through research, development, and implementation of innovation in the schools," he said when the merger was announced. Harold H. Howe, 2d, U.S. Commissioner of Education, said that the merger will result in an organization "significantly stronger" than either of its predecessors which will make a "very significant contribution to American and world-wide education."

The president of the new Education Development Center is Arthur L. Singer, Jr., formerly ESI President, who was assistant dean of the M.I.T. School of Humanities and Social Science and more recently executive as-

sociate of the Carnegie Corporation. Among its trustees are James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation who was chairman of ESI; Martin Meyer-son, President of the State University of New York at Buffalo who was formerly director of the Joint Center for Urban Studies of M.I.T. and Harvard; and Jerrold R. Zacharias, Institute Professor and Professor of Physics at M.I.T., who is also vice-president of EDC.

The Institute for Educational Innovation was founded as one of 20 regional educational laboratories supported under the Elementary and Secondary Education Act of 1965. Educational Services Incorporated was a privately operated organization first formed to handle the new high school physics course drafted by P.S.S.C.; its activities have included elementary science and high school humanities curriculum development, teaching film series, book publishing, and overseas educational programs.

The new organization will continue ESI's curriculum development projects at the ESI location in Newton, Mass., and it will focus especially on the schools' responses to such local—but nearly universal—problems as the rapid growth of suburban schools, the exodus and decreasing demands on urban schools, and the special needs of schools in relatively small rural communities.

Reporting the merger, Robert L. Levey, education reporter for the Boston *Globe*, said that ESI's emphasis on curriculum and course content "will now likely give way to more research on the social context in which youngsters are educated. As one EDC researcher put it, 'we're getting to be more and more concerned with the ecology of education.'" □

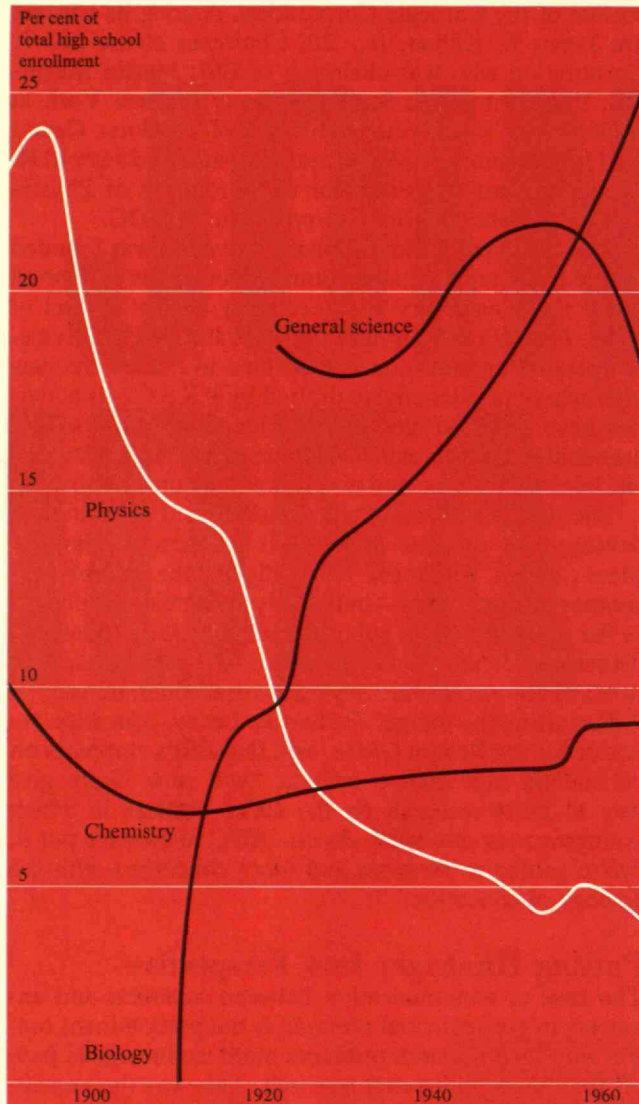
Putting Hindsight into Perspective

The ease of communication between scientists and engineers in goal-oriented research is the predominant reason why such research produces more technological payoff than does undirected research. This was the conclusion of Colonel Raymond Isenson, Engineering Director of Project Hindsight, at a recent Sloan School Seminar.

Project Hindsight was the study of recent science and technology used by the Department of Defense in weapon systems. Its preliminary report showed that 96 per cent of significant scientific and technological contributions to weapon systems were funded by the Defense Department or defense industry, while only 0.3 per cent of such contributions came from basic research with no commercial or DoD objective. The preliminary report has played a large part in blackening the image of basic research among government circles in recent months.

Colonel Isenson pointed out that when an engineer or scientist in a goal-oriented project comes up against a problem, he generally knows who will be able to help with it; scientists in "pure" research do not have the ad-

"Accumulated experience with their environment enables Americans to be more sensitive to the full effects of their manipulation of water, soil, air, plants, and animals. At the same time, they increasingly realize that they can now afford to do things beautifully as well as efficiently."—Report of the Committee on Water of the National Academy of Sciences—National Research Council, 1966.



DATA: HARVARD PROJECT PHYSICS

In a period of rising total school enrollment, the percentage of high school students taking physics has been dropping almost continuously in the last 70 years. Other high school sciences have held their own or registered gains in enrollment percentages.

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vantage of such instant communication. He also hinted that the full report, to be published during the summer, will lift some of the gloom that the preliminary version has caused among the academic community.

Among other points in Colonel Isenson's seminar were:

- Technological forecasting is at present no more than an art; the models are quite naïve, and every forecaster has his own peculiar technique.
- Much so-called scientific research today is no more than technological plodding.
- Contrary to popular belief, there are very few examples of technology developing from basic scientific research; the development of transistors and of long-chain polymers are about the only two instances.
- Science and technology support each other in bearing the burden of progress like two one-legged men leaning against each other. The classic picture of science bearing technology on its shoulders is no longer tenable. □

Physics as a Humane Science

A new high school physics course known as Harvard Project Physics is now being tested in 55 schools throughout the U.S. Its target is the two million or more students who now take no physical science (except perhaps chemistry) during the last three years of high school.

Since 1948 physics has attracted a steadily declining percentage of high school seniors. Figures for 1964-1965 quoted by Harvard Project Physics confirm that far more students than ever before are taking no physics of any kind.

Yet, Fletcher G. Watson of the Harvard Graduate School of Education has written, physics through its long history has had "profound effects" on Western culture. "It provides an almost ideal vehicle through which young people can inspect science in the making and engage to some extent in the same process." All students, he says, should come to see it as "a beautifully articulated and yet always unfinished creation at the forefront of human ingenuity . . . To be ignorant of it may therefore leave students unprepared for their time."

Dr. Watson, who is co-director of Harvard Project Physics, believes that many of the students who now take no high school physics at all are "strongly people-centered, being interested in literature, history, art, music, languages, and all the humanities."

So the new course attempts to treat fundamental physical ideas "in a humane context." It uses mathematics only in "essential instances"; but it makes "extensive use of quotations, references to literature and poetry, significant art materials, and the cultural settings within which various physicists worked." There is emphasis on how modern physical ideas have developed, the effects of physics on other sciences, and the way in which the progress of physics contributes to contemporary technology and in turn is stimulated by it.

One of the collections of supplementary readings, for instance, includes excerpts and essays by Fred Hoyle, I. Bernard Cohen, Anatole France, Michael

Faraday, Richard P. Feynman, '39, Isaac Asimov, Arthur C. Clarke, William Shakespeare, Isaac Newton, and George Gamow.

There are six textbook units. There will also be some 20 supplementary units on such topics as electricity and magnetism, particle physics, accelerators and reactors, vectors, and theories of precision; a series of film loops (designed for classroom or "at-home" use); transparencies; laboratory notes; and special laboratory equipment.

The project is under the joint direction of Dr. Watson, F. James Rutherford, assistant professor of education, and Gerald Holton, professor of physics, all of Harvard. It has headquarters in Pierce Hall on the Harvard campus, and it has support from Carnegie Corporation, the National Science Foundation, the U.S. Office of Education, and other agencies. Several members of the M.I.T. Faculty, including Irving Kaplan, professor of nuclear engineering; William A. Shurcliffe, research affiliate in physics; and Bruno B. Rossi, Institute professor (physics), are participants. □

The End of Project West Ford

Project West Ford of Lincoln Laboratory, erstwhile center of tempestuous (often excessive) controversy, has come to a quiet close.

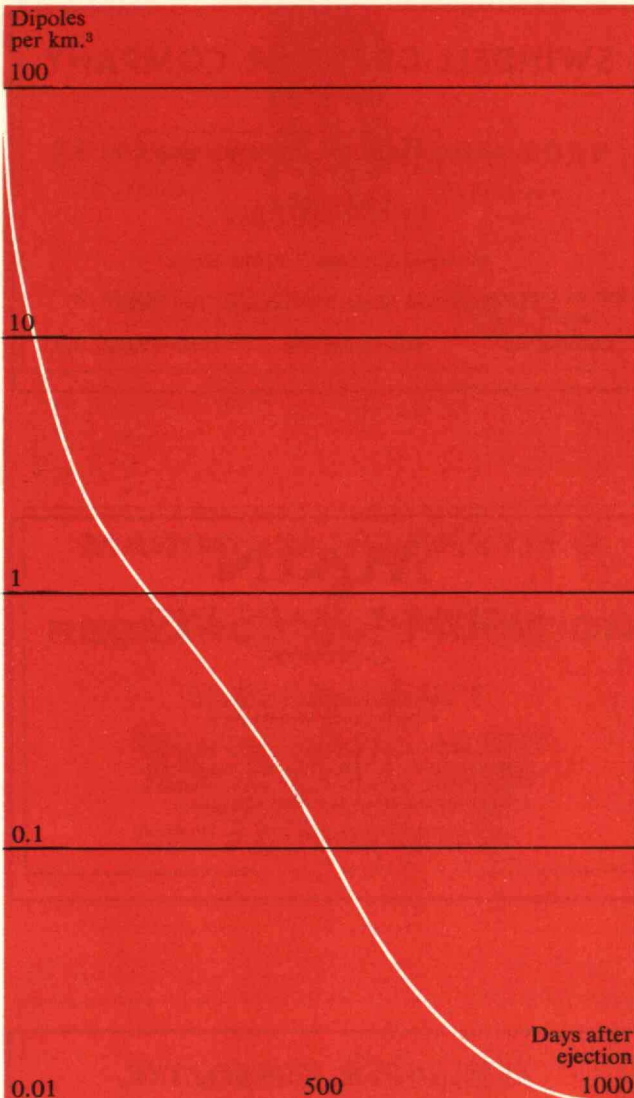
The 480 million tiny copper dipoles placed in orbit in 1963 to provide a reflector for world-wide radio communications have been forced back down into the lower atmosphere by the pressure of light from the sun and thence have sifted imperceptibly back to earth, precisely as predicted.

No fireworks accompanied their descent. Writing in *Science* magazine, Irwin I. Shapiro of Lincoln Laboratory notes that the dipoles were expected to radiate heat rapidly enough to prevent their disintegration upon reentry, and most probably floated back to earth unharmed. But the chances of finding one are small indeed: "A simple calculation demonstrates that the maximum macroscopic surface density is about five dipoles per square kilometer . . . No funds were solicited for a recovery operation."

West Ford was an experiment, conducted by Lincoln Laboratory for the U.S. Air Force, to evaluate a novel concept for global strategic military communication that would be extraordinarily resistant to disruption by any natural or hostile influences. The concept called for placing hundreds of millions of tiny tuned-wire dipoles in orbit, thousands of miles above the earth, to form a very narrow, extremely diffuse circular ring or belt. A minute fraction of the energy in a powerful microwave radio beam directed at the belt would be intercepted by the satellite dipoles, scattered in all directions, and thus relayed to sensitive receivers thousands of miles away from the source.

In principle, this was a natural extrapolation of a proven and accepted technique, called tropospheric scatter, for beyond-the-horizon communication via radio waves scattered back to earth by the natural inhomogeneities in the (relatively dense) lower atmosphere—much as the headlight beams of an approaching automobile can be seen, on a misty night, before the car itself has come into view over a hill.

In practice, many difficult problems had to be solved before the concept could be tested in space, and the solu-



The dipoles orbited by Lincoln Laboratory's Project West Ford have gradually dispersed into the lower atmosphere and finally back to earth. The interference with optical and radio astronomy, feared by some astronomers, turned out to be "negligible," as originally predicted by Lincoln scientists.

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tions to some of these generated advances in microwave components and techniques that have proved to be valuable by-products of the West Ford experiment. Several independent considerations made it essential to use the highest possible microwave frequencies and the smallest possible amount of scattering material in orbit; these requirements spurred the development of more powerful transmitters, more sensitive receivers, larger, precision-surface, narrow-beam antennas, and new antenna-pointing techniques, all of which have since proven useful in other applications. Versatile new methods of signal modulation and coding were developed to deal with a multiplicity of reflections from the spatially dispersed, moving dipoles.

Members of the Lincoln Laboratory staff also invested a substantial amount of time and effort to insure that the communications experiment could be performed without any adverse effect on any other scientific activity, carrying out extensive, painstaking analyses themselves and aiding a number of other groups of scientists that conducted independent precautionary studies and reviews. The experiment yielded the necessary communication and propagation results without any observable adverse side-effects, in close agreement with predictions.

When West Ford was launched there were widespread fears that the dipoles would interfere with optical and radio astronomy. Lincoln Laboratory calculations showed that the interference would be negligible, and "the experiment verified these predictions," according to Dr. Shapiro. "No radio observatory detected signals reflected from the dipoles at any frequency," he wrote; only very early in the course of the experiment, when the dipoles were concentrated near their dispenser, could astronomers record a photographic image and only during the first week could they detect sunlight reflected from them. □

Toward a Technology for Diversity

Recommendations for the creation of "public television" contained in the report of the Carnegie Commission on Educational Television, of which James R. Killian, Jr., '26, was chairman, have been greeted with general and significant enthusiasm. The Commission report, first released in January, has now appeared in paperback (Bantam Books, \$1) and in a hardcover (Harper and Row) edition.

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The thrust of the report is its plea for diversity: "We seek for the artist, the technician, the journalist, the scholar, and the public servant freedom to create, freedom to innovate, freedom to be heard in this most far-reaching medium. We seek for the citizen freedom to view, to see programs that the present system, by its incompleteness, denies him."

Variety magazine called the report "just possibly the most damning indictment of the commercial television medium ever rendered." James Reston wrote in *The New York Times* that it might be "one of the transforming occasions in American life." Newton N. Minow, former chairman of the Federal Communications Commission, wrote to Dr. Killian that it is "a monumental contribution to the nation's future." Rick Du Brow, United Press television writer, said the Commission is declaring "that commercial broadcasting has not fulfilled its significant obligations to the publicly-owned air waves with which it has been entrusted all these years."

The Carnegie Commission's plan for "public television" is the second major proposal to extend the power and usefulness of this medium now before the American people. Earlier, the Ford Foundation presented a plan for domestic satellites which could be used by all television programming and earn profits to fund educational stations. However, the Carnegie Commission, in its search for ways to make the medium better serve all the many interests of television viewers, had some misgivings about the centralizing effects of satellites. It chose instead to recommend a separate corporation which would with the aid of taxes on new television sets help underwrite public television stations and help them to develop significant programs for local, regional, and national use on all stations utilizing the reserved "educational" channels.

"Just as we need the little magazines, the university presses, and the specialized books, we need a diversity of stations and programming in the television field," Dr. Killian, who is chairman of the M.I.T. Corporation, told *Technology Review*.

A beginning realization of the Carnegie plan is proposed in President Lyndon Johnson's Congressional message on education and health. He asked for creation of a Corporation for Public Television and a \$9-million first-year appropriation for production centers and local stations, postponing the question of long-term financing.

The Carnegie Commission plan is designed especially to permit the Corporation for Public Television to seek and take advantage of new technology which may in the future increase the effectiveness of television broadcasting, and two supplementary papers published with the Commission's report are of special interest to this end.

Changes in electronics for improving the quality and distribution of television are fairly predictable for the next decade, says Albert G. Hill, Professor of Physics at M.I.T., because "our understanding of electronics and electromagnetic techniques is very deep and breakthroughs in basic principles are unlikely." Foreseeable developments, Professor Hill wrote for the Commission, include less expensive network facilities, better storage devices, "small" improvements in set quality, and better program distribution methods. But progress in materials research, which may also affect the capability of television as a form of communication, is much more difficult to predict; this is because "our understanding of ma-

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terials is really in its infancy and the field is still wide open for very major advances."

A very different line of thought about television communication technology emerges in Joseph C. R. Licklider's paper on "Televistas," also written for the Carnegie Commission. In it he points out the importance of interresponse between program and audience—and the difficulty of achieving this with a one-directional communications medium such as television. The best available substitute, writes Dr. Licklider (who is visiting professor of electrical engineering at M.I.T. this year), is to give the viewer a chance "to select from an ensemble of transmitted alternatives the one that is most appropriate to his needs or interests." By this Dr. Licklider does not mean simple channel selection: he is anticipating "broader and more systematically organized" options and "more convenient and more sophisticated ways of selecting" among them.

For example, let a single television channel be divided into 10 sub-channels, so that every tenth of the 30 images sent every second to form the conventional moving television picture is in fact a unit of a "still" picture. The viewer then can select from among 10 different "stills" that which most interests him. In a program from an art gallery, for instance, a control on the receiver might permit the viewer to select whatever part he likes of the over-all picture. Thus, writes Dr. Licklider, "the viewer can let his eyes explore a painting almost as though he were before it in the gallery; or he can follow spontaneously the action of a dynamic scene."

A standard newspaper column of text contains about 4,000 characters. The information requirements to transmit moving television pictures are so great, Dr. Licklider points out, that "a conventional television channel could carry the alphanumeric contents of a 30-page newspaper each second.

"The main trend of educational television is somewhat too conservative in its estimation of the feasibility of selective, interactive, and intercommunicational television systems. It is important to keep the mind open to periodic reassessment of the values and costs of various ways of using the resources available to television," Dr. Licklider says.

This broad view of the public interest is one of the benefits promised by the Corporation for Public Television. □

Second New Celestial Object

The visual identification of a second strong x-ray source in space has strengthened the belief that a completely new class of celestial objects has been discovered. The new finding, based on a rocket flight on October 11, 1966, was reported by Riccardo Giacconi, of American Science and Engineering, Inc., at the Texas Symposium on Relativistic Astrophysics in New York at the end of January.

Over 30 sources of x-rays, all beyond the solar system, have been spotted since the first discovery of such sources in 1962. The Crab nebula, the result of a gigantic explosion seen by Chinese astronomers in the Eleventh Century, was the first source of x-rays identified with a

visible object. Last year accurate measurements of the position of the x-ray source Sco X-1, by a team from American Science and Engineering and M.I.T., enabled optical astronomers to identify it with a star of the 13th magnitude (Technology Review, November, 1966). The Sco X-1 source is totally different from sources such as the Crab.

In view of the peculiarities of Sco X-1, such as the fact that its emission of x-rays is 1,000 times as energetic as its optical emission, the group believed that they had discovered an unsuspected new class of stars, which they called extars.

The second identification of an extar resulted from improvements in the location of x-ray sources by the American Science and Engineering team. Last October's rocket flight pinpointed the location of a star in the constellation Cygnus and also showed that it would have a minimum optical magnitude of 16. Armed with this information, and suspecting from the Sco X-1 experience that he should look for a star emitting strongly at ultraviolet wavelengths, Allan R. Sandage, of Mount Wilson and Palomar Observatories, found the optical equivalent of the source. The visual appearance of this new extar, now known as Cyg X-2, closely resembles that of Sco X-1. Since its intensity is about one-twentieth of that of Sco X-1, it is presumably about four or five times as distant, although probably still in our own galaxy.

What is the likelihood of further identifications of extars? Fairly small in the immediate future for sources within our galaxy, according to Institute Professor Bruno Rossi, who stimulated the original discovery of x-ray sources in space. Most of the known x-ray sources lie in the plane of the galactic equator, unlike Sco X-1 and Cyg X-2. Here, they are partly obscured from view by the interstellar dust which pervades much of our galaxy. Further, they emit less x-ray and optical energy than Sco X-1. This means that the accuracy of locating their positions must be greatly increased, for the number of faint stars in any portion of the sky is far greater than that of brighter ones. At present, even the most sophisticated measurements are hardly capable of giving sufficiently accurate locations. But extragalactic sources may well show up very soon.

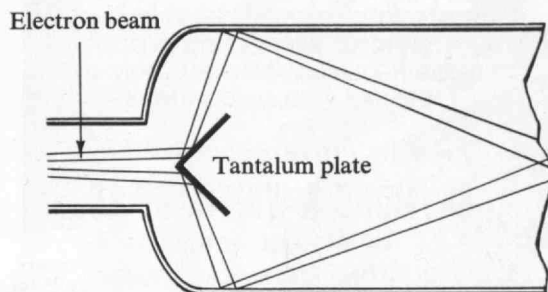
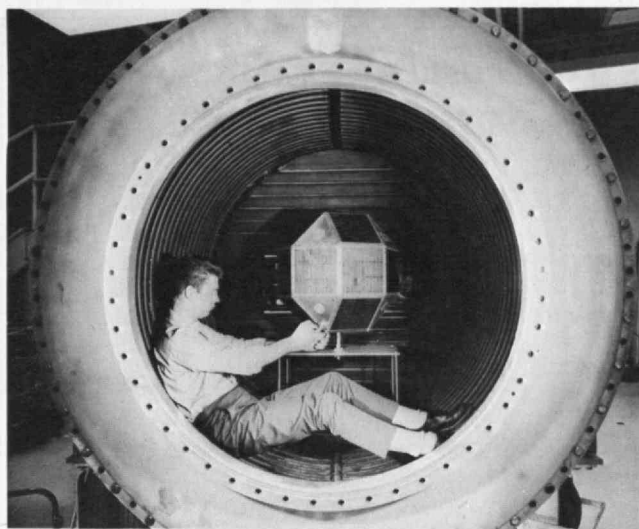
The picture for our galaxy might change if an x-ray telescope were mounted in a satellite or a manned orbiting laboratory. Dr. Giacconi is now designing a telescope for such a laboratory, which would be able to take a far longer look at x-ray sources than rocket-borne instruments.

Although only two extars are known to exist, theoreticians are hard at work to explain their properties. At present the most favored theory accounts for them in terms of a very hot mass of gas—at 50 million degrees C. But spectral lines from various elements suggest that their constitution is more complicated than this simple picture suggests. □

Simulating the Van Allen Belts

Electronic equipment in satellites may remain undamaged substantially longer than present accepted estimates. And improvements in shielding materials and the geometry of satellites might extend these lifetimes even further.

These are two conclusions from experiments using the Lincoln Laboratory's accelerator to simulate the radia-



Satellite in radiation chamber (top) is prepared for exposure to simulated Van Allen belt radiation. This Lincoln Laboratory facility simulates Van Allen radiation far more accurately than simpler methods using only a beam of particles, because it reproduces the directionality and spectrum of energies characteristic of particles in the real thing. To achieve this, a wide beam of electrons (bottom) strikes a tantalum plate and the walls of the vacuum chamber; reflections from these surfaces produce a dispersed beam with a spectrum of energies.

tion in the Van Allen belts. Charles L. Mack, Jr., staff physicist at Lincoln Laboratory, reported this work at the fifth Aerospace Sciences Meeting of the American Institute of Aeronautics and Astronautics in New York at the end of January.

The two Van Allen belts, first discovered in 1958, are bands of atomic particles circling the earth at altitudes of between 800 and 56,000 miles. While satellites merely passing through the belts suffer relatively little damage, intense radiation can severely affect electronic parts in vehicles which spend most of their time in the Van Allen belts; among these are communications satellites.

In order to obtain some quantitative idea of these effects, scientists have directed beams of atomic particles, all with substantially the same energy, at satellites in vacuum chambers. To make allowance for the fact that radiation in the Van Allen belts is neither beam-like nor constant in energy, the groups have used mathematical methods of extrapolation. However, Mr. Mack's group has now succeeded in achieving true simulation of the Van Allen belt radiation in terms of dispersion and energies, and in doing so has shown that the indirect techniques are in fact way off the beam.

In the Lincoln set-up, a wide single-energy beam of electrons strikes a V-shaped plate of tantalum, placed at

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Trend of Affairs

the entrance to the vacuum chamber containing the satellite under test (see figure). Reflections from this plate, and subsequently from the walls of the vacuum chamber, serve to reduce the particles' energies by varying amounts, producing a spectrum of energies, and also to disperse their directions. Thus the satellite is bombarded by radiation with a spread of energies coming from many directions—conditions very similar to those it would experience in the Van Allen belts. The only snag making this type of simulation less than perfect is that, since only one beam is involved, the radiation still comes from a preferential direction, rather than randomly from all of space. At present, Mr. Mack sees no way of overcoming this apart from using mathematical extrapolations.

The simulations have shown that the internal electronics of satellites can stand up to Van Allen radiation better than previous simulations predicted for two reasons: satellite shielding reflects dispersed radiation away from the delicate instruments at the satellite's center far more effectively than it wards off radiation from a single beam; and the combined effect of all the particles in a beam with a range of energies causes less damage than is predicted on the basis of measurements using beams of constant energy. These reductions combine to prolong the life of many electronic components by as much as a hundredfold. Strong support for the Lincoln results comes from the fact that Early Bird, the first commercial communications satellite, is still working after nearly two years in the Van Allen belt, long beyond its predicted lifetime.

What concrete results have the Lincoln Laboratory simulations produced in terms of further protection for satellite hardware? Mr. Mack's results suggest that improvements can be made in the geometry of satellites and in the materials which make up their internal shielding. Some of these techniques have already been applied in four Lincoln Experimental Satellites, now in orbit, the first satellites to be tested in the simulator. The geometric improvements at present await incorporation into a satellite.

To obtain the most efficient shielding from the satellite shell, present results indicate that the shell should be spherical and large—perhaps 10 feet in diameter—with instrumentation deeper inside the core than in present vehicles. Communications satellites in synchronous orbit above the equator could have cylindrical shapes, because radiation in this area bombards satellites at a constant angle. □

Pollution—the Whole Picture

"You cannot curb one pollution problem without creating another." So said Richard J. Frankel of Resources for the Future, Inc., the Washington-based organization studying the whole field of U.S. resources, in a seminar arranged by M.I.T.'s Department of Civil Engineering.

Dr. Frankel spoke on the problems of comprehensive environmental management, with particular reference to the coal industry. He believes that coal will surely hold its own as a power-generating fuel until 1980 and will probably continue in importance to the next century, in spite of the rapid growth of nuclear power generation.

Even today, when coal is the *enfant terrible* in the eyes of pollution scientists, it is no simple job for an organization to change from coal burning to a 'cleaner' method of producing energy. Dr. Frankel cited the case of Consolidated Edison in New York City. At present this coal-fired plant produces a large proportion of the city's notorious air pollution. The organization has suggested the construction of a nuclear power plant for future generation of the city's electric power, but social concern about the dangers of radioactive residue in the urban area forced them to drop the idea. CE then looked at the possibility of building a hydroelectric power facility on the Hudson River at Storm King Mountain. But conservationists stepped in with the objection that the facility would spoil the natural environment.

This saga, Dr. Frankel stressed, shows that the power industry must take note of all possible aspects of the environment in considering alternatives to fossil fuels.

But whatever the pollution problems that other fuels create, coal still retains its bad name, and the industry must come up with constructive ideas for combating pollution—ideas which will prove cheap enough to allow coal to retain its present small price advantage over oil and natural gas. One scheme under study by Dr. Frankel is the mine mouth power plant: coal would be burned at the mine, and the resulting energy transmitted to the consumer through high-voltage cables. This would both save transportation costs and localize pollution. But conservationists would have to be assured that the power lines would not destroy the aesthetic environment. □

The Cream of the Crop

Over 224,000 American scientists (engineers were not included) responded in 1964 to the National Register of Scientific and Technical Personnel of the National Science Foundation. Two and a half years later, with the results compiled, it turns out that one-third of them were employed by educational institutions, 4 per cent more by other nonprofit organizations. And the colleges had the best of them: while 35 per cent of all the scientists in the Register had doctor's degrees, a full 60 per cent of those in colleges and universities held doctorates.

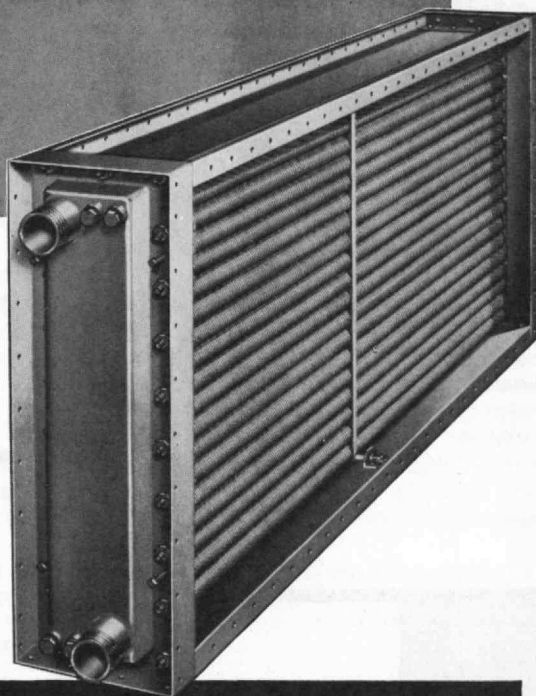
Indeed, the employers of more than half of the country's Ph.D.'s and Sc.D.'s. were the educational institutions.

Here are some other statistics about the "cream of the crop" scientists in colleges and universities:

- One-fourth (22 per cent) were less than 30 years old; the median age was between 35 and 39.
- 20 per cent were in the biological sciences, 18 per cent in chemistry, and 15 per cent in physics.
- Just over half of them said their primary duties were teaching. Over one-third were principally in research and development, and of these three-quarters were in basic (vs. applied) research.
- Their mean annual salary was \$9,600, the lowest reported of four employer groups; the three others were the Federal government (\$11,000), nonprofit organizations (\$12,000), and business and industry (\$12,000).

Nearly one-quarter of the scientists surveyed in 1964 were in New York, Pennsylvania, and New Jersey. Only 7 per cent were in the New England states, 4 per cent in Massachusetts. But the median salary in Massachusetts was \$11,000, eighth in line after Delaware (\$13,500), the District of Columbia, New Jersey, California, New Mexico, New York, and Maryland. ■

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Technology for Africa?

Leading specialists on the problems of underdeveloped nations are now appearing in a three-month lecture series at M.I.T., and against its background sophomore students in the Engineering Design Laboratory are working on a group of design projects and experiments concerned with the technological problems of West Africa's village economy.

No one will be surprised or disappointed if these projects turn up some workable and interesting solutions for Africa's problems, but their main goal is education. "Our purpose here is to involve the students in open-ended design situations characteristic of those in which they would find themselves as professional engineers," explains Robert W. Mann, '50, professor of mechanical engineering. "We try to come up with problems the students can really get excited about, and we give them a virtual carte blanche on their choice of topics."

The lecture series began in January with Alphonso A. Castagno, head of the African Studies Program at Boston University, who told the students that resistance to change is the great legacy of the Eastern mind. American technologists who go abroad to work in underdeveloped countries find themselves in a situation with which it is hard to deal, Dr. Castagno said, because the economic status of the population is low but the people have no aspirations for something unknown to them; the community organization has served for centuries and they are loath to change it; the incentive of the profit motive is absent; underdeveloped people cannot conceptualize progress and identify with it; comprehensive economic planning is impossible because the basic data are not available; concepts of time and work are different.

The central problem in developing underdeveloped countries is the conflict between the East's resistance to change and the West's orientation to progress and achievement, said Dr. Castagno. "The difference between ourselves and the East is that change is more easily accomplished." But in the modern world, Dr. Castagno said, "we cannot have an Africa opposed to modern thought." So, he argued, "we must learn to think in eastern terms; any project that involves innovation requires an understanding of the cultural environment."

William G. Saltonstall, former Ambassador and Peace Corps director in Nigeria, the fifth lecturer in the series, said that before he left Nigeria the

prime minister of that nation appealed to him for better trained, and more experienced, people. But the prime minister made clear, they "valued workers more for what they were than what they knew."

Indeed, said Ambassador Saltonstall, Nigerians were always asking him if civil rights denials, air pollution, and poverty are the signs of a developed country; if so, they thought perhaps they would rather remain "undeveloped."

Other lecture series speakers scheduled for the term include Dwight S. Brothers, of Harvard University, a member of the subcommittee of the President's Science Advisory Committee studying U.S. technical aid; William R. Charleson, research associate in the Harvard Center for Studies in Education and Development; Dale B. Fritz, technical projects coordinator for Volunteers for International Technical Assistance; Max F. Millikan, director of the M.I.T. Center for International Studies; and George C. Lodge, former director of the International Division of the Harvard Business School.

Overseeing the student projects with Professor Mann are S. William Gouse, Jr., '53, Igor Paul, '60, and David G. Wilson of the Mechanical Engineering Department.

M.I.T. and the C.I.A.

Neither M.I.T. nor its students have clandestine (or any other) ties with the Central Intelligence Agency.

An ill wind blew across the M.I.T. campus late in February with disastrous results for 11 automobiles in the Sloan Campus parking lot. A 70-mile gust bent backwards upon itself the 300-foot boom of a crane being used in construction of the Eastgate apartments. By great fortune, no one was injured.



Many news media have pointed out in the past few weeks that M.I.T.'s Center for International Studies was founded with funds wholly supplied by the CIA and suggested that some of its research had been published with CIA assistance.

But Max F. Millikan, director of the M.I.T. Center, recalls the announcement, almost one year ago, that M.I.T. would terminate all its CIA contracts effective last July. This was, he said, to preserve M.I.T.'s ability to conduct effective foreign research, not because its academic integrity had been in any way compromised. As Dr. Millikan writes elsewhere in this issue of *Technology Review*, there have been widespread—though largely unjustified—suspicions that "any scholar supported by funds from certain government agencies must be using his status as scholar to cover for some clandestine activity."

Concerning the M.I.T. Press, Carroll G. Bowen, its director, issued a statement saying that the Press "has never used CIA money to publish studies in any field. Over the years the M.I.T. Center for International Studies has produced more than 100 books, of which the M.I.T. Press has been proud to publish 26. These books have been accepted for publication by the same process and on the same critical basis as all our other publications. To infer that any funding agency, government or otherwise, has dictated the selection of titles . . . confuses the support of research with the privilege

of publication."

The National Student Association, whose CIA ties precipitated the current wave of inquiry and criticism, has been absent from the M.I.T. campus since 1959. That summer the Institute's delegation to NSA's national conference—Farley Fisher, '60, Christopher R. Sprague, '61, Mrs. Linda Greiner Sprague, '61, and Frank A. Tapparo, '60—returned to report that NSA "is reinterpreting its constitution in order to deal with issues not within the scope of 'students in their role as students.'"

Later that fall Institute Committee, of which Mr. Sprague was then chairman, disaffiliated M.I.T. from NSA because it "was so concerned with legislation on international issues that it is neglecting the American college student."

"Wisdom and Travail"

Following the death of J. Robert Oppenheimer, the distinguished American physicist, on February 17, M.I.T.'s physics faculty joined in a statement which described him as "perhaps more than any other man, participant and determiner in the growth of American physics from a mere hopeful province of world science to a place of unquestioned leadership, and moreover to unprecedented influence in the gravest issues of war and peace."

"That we still live in a world shadowed by the thermonuclear bomb, and yet live in it with some hope, is a mark both of his wisdom and of his travail."

The brilliance of Dr. Oppenheimer's personal contribution to physics "does not outshine the luminous personal leadership" which he gave to colleagues at Berkeley, Pasadena, and Princeton, said the faculty statement, "when he created out of his learning, taste and devotion a great school of American theoretical physics."

Aquanauts

Day sessions of the 13th annual International Underwater Clinic of the Boston Sea Rovers are scheduled at M.I.T. on Saturday, April 29, and more than 1000 scuba divers and other kinds of water-bugs are expected.

Topics on the program include New England shipwrecks, training seals, raising manatees, living and working under water, underwater vehicles, underwater life support, shark problems, underwater Mexico, and underwater publications. Admission for the day will be \$1.50, and program details are available from Delbar P. Keily, '34, M.I.T. Department of Meteorology.

Crossroads Africa

Three M.I.T. students were among over 300 U.S. collegians who joined Operation Crossroads Africa for the summer of 1966. Each one raised—and paid—\$1,000 for the experience of sharing primitive work on some African community project for three months, and Crossroads Africa provided \$750 per person toward the summer's total expenses of \$1,750.

John F. Kennedy called Operation Crossroads Africa "the forerunner of the Peace Corps," and the students who went from M.I.T. last summer found fulfillment of their two aims: to achieve a worthwhile material goal for an African community, and to build "bridges of friendship," in the words of Crossroads Africa's motto.

The three M.I.T. representatives were Carol E. Hoffman, '68, Yves F. Kraus, '68, and Christopher G. Scott, '67. Miss Hoffman went to Ethiopia, Mr. Kraus to Togo, and Mr. Scott to Dahomey. They worked at manual labor, on unskilled tasks essentially foreign to their backgrounds. But this was the work that needed doing, and, as Mr. Scott says, "a lot of barriers disappear when two people willingly share a heavy burden under the hot African sun."

M.I.T.'s 1966 Crossroads Africa Students have written of their experiences in these three accounts for Technology Review:

"Mamala Kumala"

Carol E. Hoffman, '68

There were nine of us, from all over the United States—and one from Canada. We were originally scheduled to go to Arba Minch, in southern Ethiopia, to build roads. The rainy season forced a sudden change of assignment, and we were sent to Debre Zeit to work on a schoolhouse instead. The project

at Debre Zeit was a self-help project, initiated by the people who lived near the school and supported by the Ministry of Community Development. Volunteer Ethiopian workers had already started on the two-room addition when we arrived. School was in session in the other rooms of the schoolhouse—make-up sessions for children who had done poorly during the regular term.

In the beginning, they came out of the schoolhouse during recess and stood around and watched us. They were very young, their eyes very big. From behind closed doors we sometimes heard voices in Amharic—sometimes in English. The two rooms grew. At the end of our first day, the upright poles and some of the crosspieces were positioned. By the end of the week, the head carpenter was working on the roof. We felt very uncertain, and were fairly convinced that our presence on the worksite was a drag rather than a help. Every day an extremely dignified man in the semi-traditional white suit came by and watched the building for a while. He came around to each of us and shook our hands. Every few hours the children came out of the schoolrooms for recess and watched us.

Gradually we found a place in the town. We found someone to cook for us, and learned (with varying degrees of success) to like wot and injera (some of the spiciest food in the world)—in their milder forms. We learned where the post office was. We learned about the market and wandered through it on weekdays and on market days. It was still the beginning, however, and we felt very alone. When we sat out on the lawn of our dorm at night to watch the lightning or the stars, there were only ten of us—and we talked mostly about home.

Then small things started to happen. One recess, one of the girls in the group



started to play patty-cake with one of the more bold children. Soon they were surrounded by a swarm of children, all very big-eyed. A few of the children started to join in. Soon everybody wanted to play. Somebody started singing a simple nonsense song "Mamala kumala kumala vista." Pretty soon the children were joining in with great enthusiasm. From then on, recess was marked by a crowd of children following us around and softly singing "Mamala kumala" and waiting for us to join in. We racked our brains for more nonsense songs and patty-cake routines. There seemed to be a division of opinion about whether the first line went "Mamala kumala kumala vista" or "Mamala kumala kumala Peace Corps"—but everybody agreed that the last line ended with an enormous "Y-O-U"!

Slowly we were finding a place in the town. People waved to us as we walked to and from the worksite. Some of us found work to do at the community center—holding adult education classes in English. Others worked part-time in the town's Health Center, doing laboratory work or nursing work, under the direction of Ethiopian medical officers. At the Ethiopian Evangelical College where we were living, some 60 young Ethiopian teachers moved in for a few weeks' refresher course. At night we sat on the back lawn and talked about many things, or played chess or checkers or rock 'n roll records, or watched the lightning. We organized a few volleyball games and got thoroughly beaten. We stopped counting the days.

"Mamala kumala," meanwhile, spread like wildfire. Our rambles on weekends took us farther and farther from town—and it seemed that everywhere we went there was always a little child ready and waiting to yell "Ma-

mala kumala" at us. Several of the boys in the group developed an almost pathological aversion for the song and threatened dire consequences to anyone who introduced another nonsense song into Ethiopia.

We became well acquainted with the dignified man. He still came down to the worksite every day, and shook everybody's hand. We learned that he had donated the land that the school had originally been built on.

I do not know when any of us will go back, but I want to. And I think most of the group does, too. We have friends and ties in Ethiopia. I do not think those ties will remain permanently broken, or that this summer will remain a brief sterile interlude. Something will grow from it in each of us, and we hope we left something behind.

A Bridge To Dance On

Yves F. Kraus, '68

Togo is a nation of variety—from the pounding surf of the African Riviera to the rolling grasslands on the east, to the hilly jungle area where my group spent a month and a half. It is a land of beautiful, free people trying to break loose, yet trying to retain their tradition and character. It was this continuous paradox that made each day an exciting, although sometimes frustrating, experience.

We were wined and dined by the Embassy in Lagos and Lome. Later, a refreshing change, we were introduced in the Oba's Palace. The Oba is the tribal-religious leader for all the Lagos area. Combining the functions of modern administrator and traditional Fetish chief is quite a task—the paradox is shown in the modern equipped office right next to the sacrificial room containing the sacred Fetish symbols. We were led through the palace by the Oba's personal orchestra consisting of

bugler, talking drums, large drums and gourd rattles. Even better was being led through Lagos at night by Nigerian students who wanted us to see the real Lagos—squalid and teeming with life.

From teeming Lagos we moved to quieter, French Lome, capital of Togo, where we met our African coleaders from the Bureau of Youth and Sport. Without these two, without their mirth, folklore, music, advice and discussion, argument and more discussions, the summer would have been nearly impossible. This was the way to meet Africans, to watch things move, to hear them talk and work with their nation, with that which was and always will be theirs.

Then suddenly we were in Agou-Gare greeted by the villagers and the Volontaires-au-Travail, a voluntary, self-help youth organization which was instrumental in getting us to come to Agou and with whom we worked throughout the summer. They took us out to see the school that had been begun two years ago. Materials were missing, our idealism was doused with the cold, awakening rain of reality—but the momentary dejection was lost in the elation of finally reaching the site. Quickly we felt the starvation for materials and tools, but just as quickly we learned to respect the African's ingenuity, his ability to make do. Soon we learned to fit in, we began to be accepted, and even led a little in the planning stages. The walls went up slowly as we learned the indigenous methods; the rocks were cracked with auto brake shoes used as sledge hammers, the peaks of the dividing walls between the classrooms were almost started. We had two weeks left, and the bulk of the materials finally arrived. We had already given up our travel time in hopes that we could finish the school before

(Continued on page 92)



The many and varied experiences of an African summer: Carol E. Hoffman, '68, photographed the marketplace at Debre Zeit, Ethiopia; big-eyed school children singing "Mamala kumala"; and the dignified landowner-benefactor who visited the Crossroads worksite daily. Yves F. Kraus, '68, found the Oba's Palace reception (with the Oba's personal orchestra of bugler, talking drums, and gourd rattles) a paradoxical confrontation of east and west.



leaving, but even so we were discouraged. Yet with the materials came an experienced roofer. Dejection turned immediately to electric elation which affected all of us, American, Canadians, Togolese students, and villagers of Agou. For ten days we worked like people possessed. On the next-to-last day of our stay in Agou we finished our concrete-grey building, backed by green palms, surrounded by the red clay earth, and capped with gleaming zinc which proudly beamed forth borrowed sunlight.

What had we accomplished? We had finished what we came for. We had met new people, new ideas, new situations. We had grown, become more nearly citizens of the world. We found that we could do without many of the trappings of our mechanized lives.

What had we left behind? A school which is merely the physical representation of commingled sweat, feelings, ideas—a place for the new generations to learn of themselves, their land, and the world. We had not really built a bridge of friendship, just added a new section. But many of us are going back to add still more onto that bridge. Some day it will be strong enough to walk on, and some day even to dance on.

Part of Me Is in Africa Christopher G. Scott, '67

I had never been out of America before, or known any other way of life before going to Africa this past summer. I was in Dahomey, in West Africa, helping to build a three-room concrete-block schoolhouse. I found

that when I returned to the United States, I felt very strongly that I can never be wholly at home here any more. Part of me is in Africa; but more important, much of me is changed. I have lived with people to whom French was a second language, after their tribal tongue, people with a world-view I was unable to fully appreciate, but people who are as human as myself. To know this, I had to live with them. I could not have gotten the same inner knowledge from a book, for I tried before going, and thought that I had succeeded. It is the personal interaction between different races, countries, cultures that achieves this result. This is the achievement of Crossroads.

It is this which is the real depth of the Crossroads experience: the opportunity to work and live in a different culture. This touches on all aspects of one's life, and is not infrequently difficult to adjust to—strange food, cold showers, mosquito nets, bargaining in the market place, boiling all drinking water. The constant pressure of these necessary or unavoidable details requires a profound adjustment in one's attitude toward one's environment, and creates in each person an awareness of everything new. But the people are not different; they have different customs and ideas, but the same emotions, the same sorts of personalities, as the people one has always known. The strangeness of a foreign country then becomes only the strangeness of the environment, the plants, the climate; one begins to feel at home; and this discovery is not an intellectual one, but one that is emotional and unforgettable.

Yves F. Kraus, '68, and his group worked like "people possessed" to finish their schoolhouse project (left). Christopher G. Scott, '67, made the picture of the Parakou (Dahomey) market, below.



\$2,500 for the Back Bay

Efforts to work out a coordinated plan for the redevelopment of Boston's Back Bay area have received a boost in the form of a check for \$2,500 raised by M.I.T. fraternities.

The check was presented by Kevin J. Kinsella, '67, chairman of the M.I.T. Interfraternity Conference, to the non-profit Back Bay Planning and Development Corporation, following an I.F.C. dinner at Purcell's in Boston.

Receiving the check on behalf of the Back Bay Corporation were James G. Roberts, president, and Daniel J. Ahern, executive director. Roberts is vice-president of New England Mutual Insurance Co.

"We initiated the fund raising drive among the membership in connection with our efforts to assume an active and responsible role as members and residents of the Back Bay community," Mr. Kinsella said.

Last spring nearly 200 fraternity men from M.I.T. organized and carried out a cleanup campaign in the Back Bay area. In addition, the M.I.T. students have taken an active interest in the activities of the Back Bay Neighborhood Association.

The non-profit Back Bay Planning and Development Corporation was formed by an amalgam of civic groups in the area to develop coordinated plans dealing with such problems as traffic congestion, parking, deteriorating buildings and conflicting land use.

The program is being financed primarily through private subscription to the Back Bay Planning and Development Corporation.

Impressive Debaters

M.I.T. debaters continue their impressive record in intercollegiate competition, and *The Tech* says a consensus would probably rank them "among the four top teams in the country."

The season's record so far is 61 wins, 17 losses. The latest victories were posted in a mid-February tournament at Northwestern University, where M.I.T. came out of the preliminary rounds qualifying first out of 80 schools. The Cambridge debaters finally lost only to Georgetown University, the tournament winners, in the final round; Eric C. Johnson, '67, won fourth-place individual honors out of 200 debaters at the tourney, and James J. Foster, '67, was 15th.

Meanwhile, the M.I.T. second team (Barry Rosenbaum, '70, and Gary W. Ketner, '69) placed third after Harvard and King's College at a recent St. John's University tourney.

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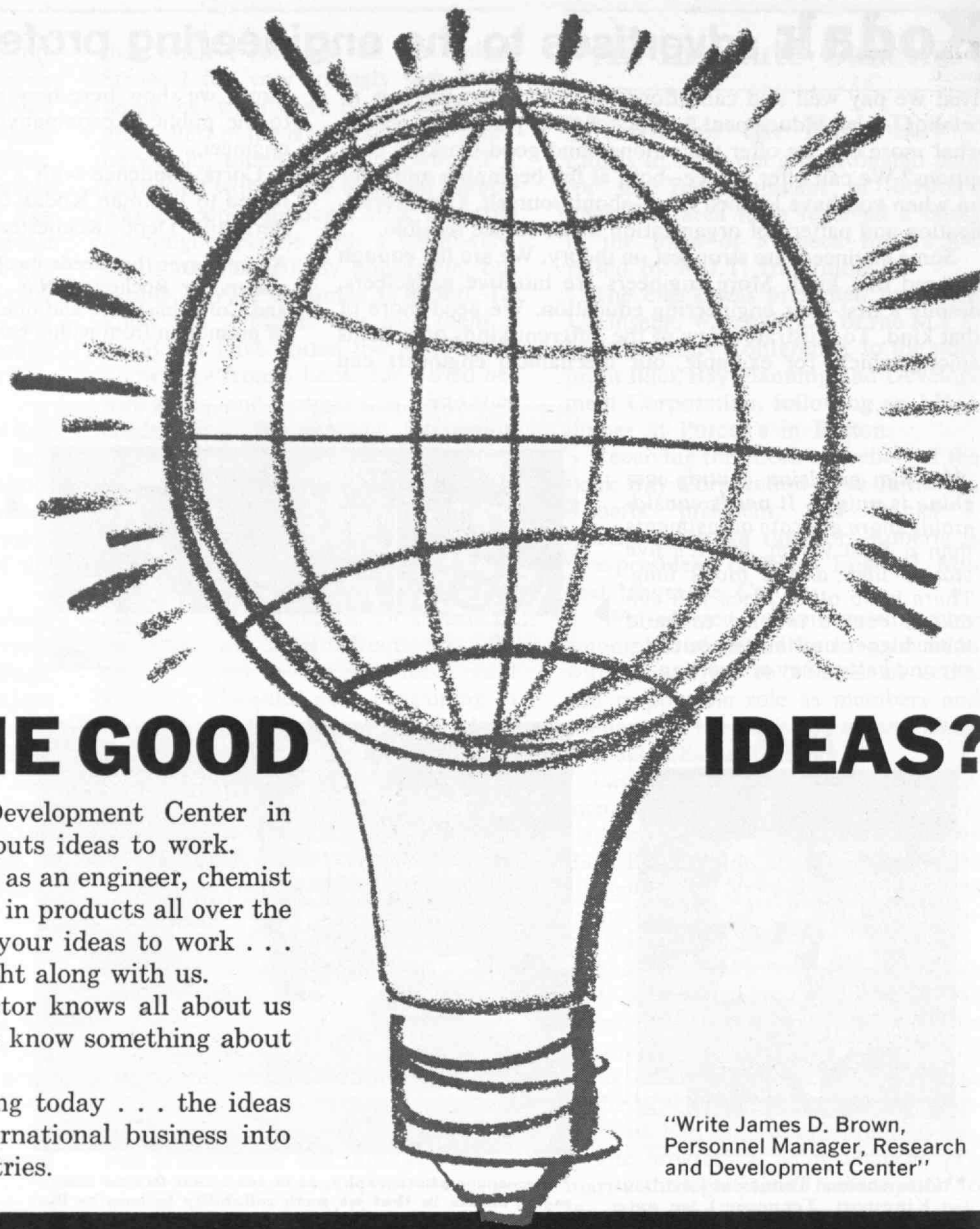
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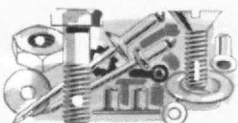
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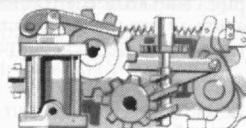
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An Institute Gazette

An Academic Environment

With a new plan for student participation in its deliberations, the Faculty Committee on Student Environment is now giving simultaneous study to five major problems which bear upon the Institute's educational environment:

- Modifications and improvements in the undergraduate houses, especially Burton House and Senior House.
- Housing and neighborhood problems of M.I.T. fraternities.
- The problems of students who live in off-campus apartments.
- The environment provided for students by M.I.T.'s main educational buildings.
- The needs of graduate students.

The committee's future plans were outlined by Ithiel D. Pool, its chairman, in a special report to the Faculty in January.

Burton House, the "least satisfactory dormitory in the whole M.I.T. system," said the report, has been the main subject of the committee's attention during the past year. While the central facilities of the House are satisfactory, Professor Pool said, the bedroom areas display a "depressing atmosphere" with conditions "under which it is amazing that anyone can study. There are walk-through rooms where the resident tries to live in what is a hallway for his suitemates. The rooms without closets are jammed with bureaus. Plaster is coming off the walls."

Burton House is the first dormitory scheduled for renovation when the completion of McGregor House gives the dormitory system a bit of "slack," but how much money should be spent and how should it be used? Meanwhile, the committee has encouraged the Institute to give paint to students who want to paint their own rooms. And, said the committee, "a very active student self-government in Burton House is drawing up a program of modest improvements that can and should be done."

In its study of fraternity problems, the committee will come face to face with the deterioration of the Back Bay neighborhood, where most M.I.T. fraternities are located. The inflow of students into the Back Bay has produced a political backlash, and now zoning restrictions prevent expansion or even modernization of student facilities there, Professor Pool said.

Students living in apartments have "attained privacy and anonymity to the point where the committee does not even know how satisfied they are

with the situation they have chosen, what their problems are, and indeed whether there is anything that any portion of the faculty or administration of the Institute should be doing to facilitate the educational experience of these independent and perhaps isolated individuals."

On the subject of the main buildings, the committee says that their "starkness and anonymity" needs somehow to be relieved. "M.I.T. classrooms leave something to be desired; so do the long halls."

To help them work on these problems, the Faculty Committee on Student Environment has invited the counterpart student committee to nominate four of its members to work with them on the five thorny issues now chosen for detailed study. It will be a test in practice of student involvement in university decision making.

Throughout the United States, says the Committee report, "this generation of students responds to the plea that they are an integral part of the university and should not be alienated from power within it. M.I.T. students express these views quietly and respectfully," the committee noted, "and we look forward with considerable confidence to this experiment in joint deliberation."

Computer Animation

Much of modern physics involves concepts far beyond the student's normal experience. Nowhere is this more obvious than in quantum physics; many

of the cornerstones of this subject actually seem to contradict the student's intuitions about the real world. In an effort to put across visual representations of the difficult world of quantum physics, Harry M. Schey and Judah L. Schwartz of M.I.T.'s Education Laboratory, in collaboration with Abraham Goldberg of the University of California's Lawrence Radiation Laboratory are producing a new series of computer-generated animated films. They are intended to simulate a scaled world in which quantum physical and relativistic effects become very apparent.

The computer takes the place of an animator, and in doing so it saves a great deal of time and labor. While a human animator would take up to half an hour to prepare a single frame for a film of this complexity, the computer can solve the appropriate equations and display the results on a cathode-ray tube within a second.

Physicists have been particularly impressed by the way in which the films illustrate scattering, a vital technique in physics today. The computer-generated film "Scattering in One Dimension" won the Italian Association of Cinematography Award at the Eleventh International Exhibition of the Scientific-Didactic Film in Padua, Italy, last November.

The group has completed three films, and has six more in process. A number of graduate students are working on these projects as part of the research for their theses.

Norman Macdonald, a popular weathercaster on Boston's WBZ-TV, is turning "pro" as a research scientist in the M.I.T. Department of Meteorology. He is associated with a project on the atmospheric winds of Jupiter and the sun, and the work may help make possible predictions of solar "storms" during which is generated high-energy radiation.

PHOTO: RUSS CLARK FROM TECH TALK



A Gallery of Visual Design

M.I.T. non-artists present
a lively collection of
their works

By Jane H. Kay

The art show could have been a "sell out." In polished and practiced array some 57 works at Newbury Street's Joan Peterson Gallery prompted demands for purchase, on the one hand, and pleas for preservation intact, on the other.

Yet, the assemblage presented itself more modestly. Under the meek heading "visual design experiments," the works created in the M.I.T. classroom of artist-teacher Robert O. Preusser spread across the gallery walls.

Since his students saw even the leading figures of the 20th century as shadowy forms, the works evolved as a series of problems calling for visual solutions. They could, however, be voiced in the vocabulary their creators knew best: scientific apparatus—computers, crystal growths, "debris" like plexiglas rods and boxes and other mechanical knick-knacks handled regularly.

In short, anything would suffice for their projects but such intimidating agents as paintbrush, pen and pencil—tools belonging to the rarified realms of art.

Art for Today—and Tomorrow

To an art critic, the sleek and decorative works fit easily into the categories of all the major art forms of the decade—op, geometric design, abstract expressionism. Many works recalled, for instance, the Museum of Modern Art's landmark show of 1965—"The Responsive Eye"—which in turn had inspired the wave of optical art.

The moiré maneuvering of well-known contemporary artists like Yvaral, Mon Levinson, or Agam could be matched in inventiveness here by, say,

mechanical engineering student William B. Zimmerman, '68, working a plexiglas panel on both sides in a moiré pattern.

Other geometric or constructionist artists and sculptors found easy parallels. Names like Naum Gabo, Sue Fuller, Moholy-Nagy and even Mondrian could be plucked from the art magazines and history books and placed next to student-counterparts who, Professor Preusser insists, would react with bafflement to artists who worked after the 1900's.

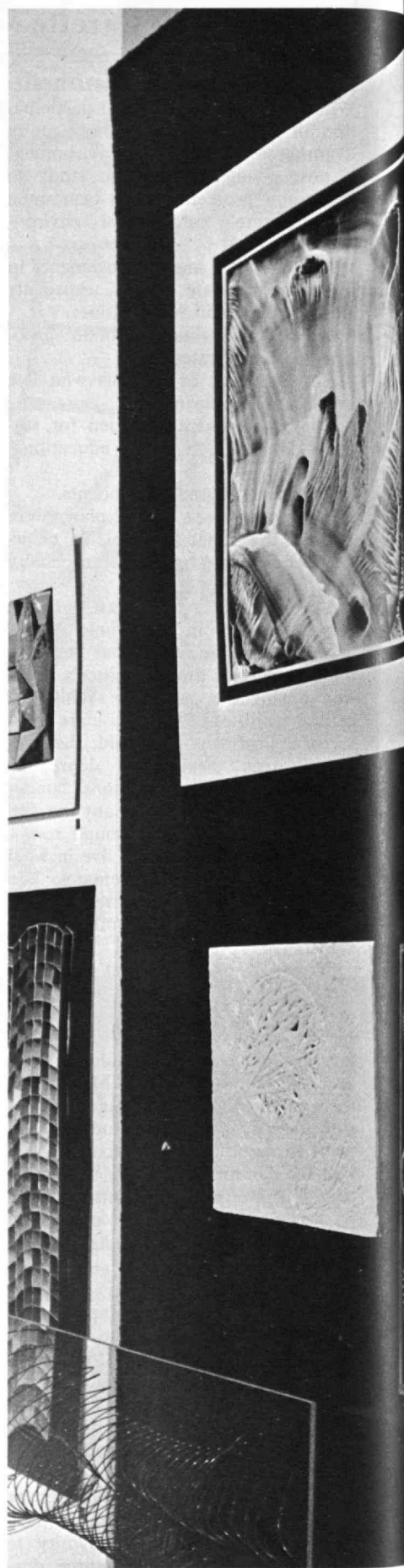
At the same time, student exercises like the nylon cords pulled taut in parallel backwards and forwards designs over pieces of plexiglas within plexiglas boxes (by electrical engineering student Koichi Yokota, '60, and others) had a definite aesthetic merit—pristine yet strangely lyrical works weaving pale tints in circular or step-like patterns.

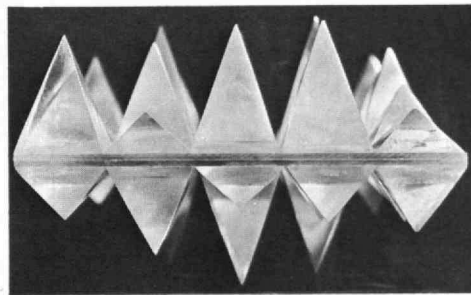
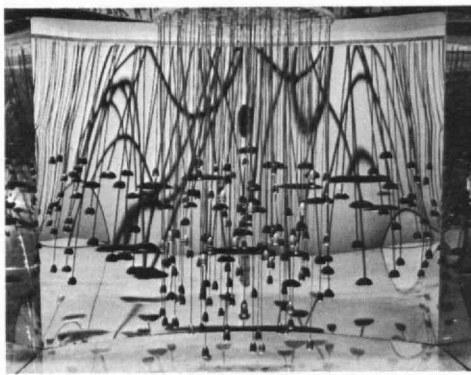
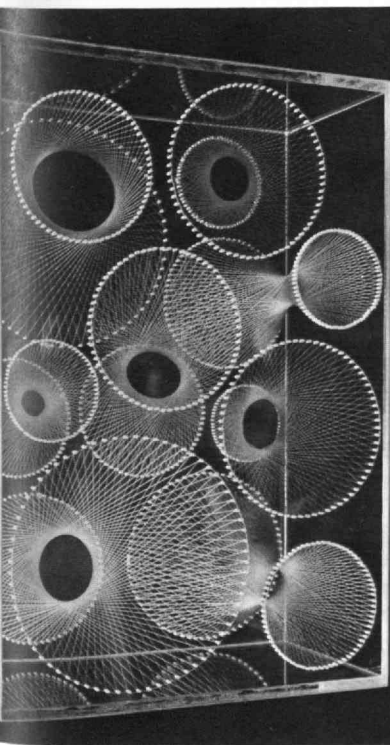
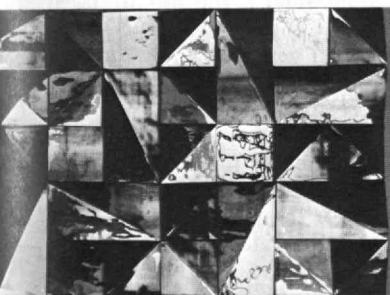
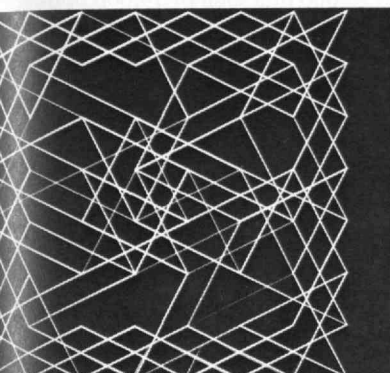
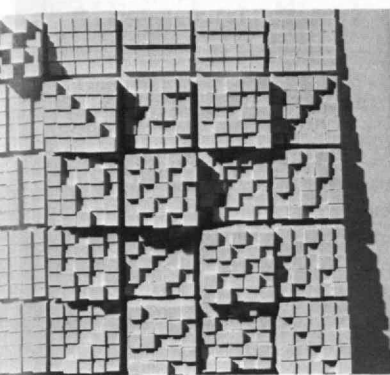
Even in the less tidy, more free-handed area of abstraction, the class assignments elicited fine responses. The inlay wood grain patterns of an aeronautical engineering student (Robert F. Flagg, '59) worked outwards from a carved center in an attractive interplay of sculptural and linear modes. One physics student (William H. Nelson, '66) used diffraction grating, cutting oblongs corner-to-corner in an abstract work; another mechanical engineering student (Viguen R. Ter-Minassion, '64) made a freer, almost biological design in handsome translucent copper colors with a print on a photo-sensitive copper circuit board, which was laid against the gallery window to show its color-catching qualities.

Visual wit emerged, too—in a cog-wheel spiral of linked paper figures and a knight made of spot-welded stainless steel. Another carved sculpture showed Arp-like sensibilities (Nicholas P. Negroponte, '66) and even scored an art first in its luxuriant treatment of the medium. Other students had used assignments in distortion to create a stage where rods and glass balls floated in an underwater ballet or colored wooden sticks bounced brightly before a curved black-and-white stripe backdrop.

Starting from that unlordly enterprise called doodles—the only leftover of most students' art inclinations—many linear works evolved. Expanded by imagination and chemical awareness (like the means of making a crystal growth emerge on a picture surface) the show was a virtuoso offering and a source for wide speculation.

It supported some of the conclusions





PHOTOS: NISHAN BICHAJIAN

Paintbrush, pen, and pencil were missing this winter when the Joan Peterson Gallery on Newbury Street, Boston, was filled with "visual design experiments" by M.I.T. students in Robert O. Preusser's classes. The student work did not reveal the artists' disciplines: budding engineers, scientists, managers, and architects were hung side by side. The only common denominators were their unconventional materials (e.g., ink in Elmer's glue) and their participation in Professor Preusser's visual design classes. The pictures on this page—top to bottom, left to right—are: Group Theory—relief by Mrs. Lenore C. Blum. Knight's Tour—computer chess problem by Sanford M. Libman, '66, and Jon D. Price, '64. Diffraction Grating—relief by William H. Nelson, '66. Structure—plexiglas and nylon cord by Koichi Yokota, '60. Mirror Distortion—mobile by Daniel Babitch, '66. Photosensitive Copper—by Viguen R. Ter-Minassian, '64. Pyramids—plexiglas sculpture by Nicholas P. Negroponte, '66.

that Professor Preusser has drawn from his 10-year old course: that the scientific student possesses the same creative potential as any other student (a conclusion that only a belief in some tired clichés could deny); and that "technology has opened up so many areas of territory of explorations for the artist."

The Trend to Merge

Approaching the show with an art observer's eye, it could be added how many professional artists have also of late enlisted the engineer and scientist. In a mixed media presentation called "Nine Evenings," held this winter in New York, for instance, pop artist Robert Rauschenberg drafted men from the Bell Laboratories to stage his "happening."

The trend to merge art and science emerges throughout the art world. As *The New York Times* noted recently: "That old art appreciation course you took as a freshman is outdated, no matter how recently you took it, and the next announcement from the schools that are really on their toes will be that Art I has been absorbed by introductory physics."

The alliance of art and science elsewhere produces such novel and undefinable works that even conservative critics are wary about criticizing or differentiating between the good and the pseudo-scientific-aesthetic.

Seeing a show like the M.I.T. "Visual Design Experiments," then, has pointed meaning to viewers of the contemporary art scene. It reaffirms impressions that the appeal of such shows—by professional arts—often rests with the exploitation of scientific simplicities, like the beauties of the structure of a cell or the pleasurable pattern of a computer-charted chess game here.

It underlines the impression that words like "attractive," "decorative," or "handsome" applied to such works do not securely make them beautiful (is the word outdated?) or artistic, in the usual sense.

In a more positive view, a look at the student show encouraged hope for the wider environment of design. So many of these ideas explored or expanded on a larger architectural scale could enhance the world we see in. This, of course, is the course's purpose. The show's limitations were not at all in the lively and imaginative manipulations of these non-artists but in the easy identification of their "exercises" with so much of the ornamental and pretty play that passes for art nowadays. ■

Accelerator Components

The release by the Bureau of the Budget of \$1.4 million in Atomic Energy Commission funds for use by M.I.T. to procure components of a 400 Mev electron linear accelerator to be constructed at Middleton, Mass., was announced in Washington late in January by Representative William H. Bates of Salem, Mass.

Congressman Bates said that previously \$175,000 of a total of \$4,600,000 appropriated for the M.I.T. Linac had been apportioned for the current fiscal year. Release of the additional money, he stated, will assure that the project will proceed on schedule and within the original estimates of cost for the \$5,400,000 accelerator. M.I.T. is providing the land and \$800,000 of the total cost, Congressman Bates said, but the Institute as yet has made no detailed announcement of the accelerator plans.

The balance of the Federal funds for the project is expected to be released after July 1 for use in fiscal year 1968, Congressman Bates said. He noted that next year's AEC budget includes \$150,000 more for the Middleton accelerator's operating expense needs.

The AEC budget for the 1968 fiscal year also includes \$150,000 for improvement of the Cambridge Electron Accelerator, operated jointly by Harvard and M.I.T. on the Harvard campus.

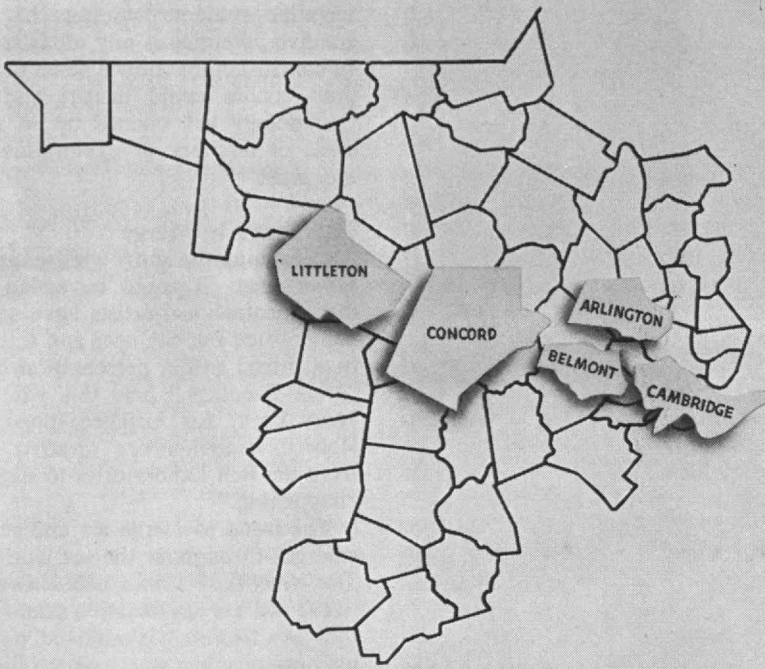
Really a "Tech Man"

Though he is a physicist by training and at heart, Julius A. Stratton, '23, is really a "Tech man," a man "constantly running beyond his own professional knowledge into other areas of thought and action, . . . trying to make some sense out of the modern condition," says Elting E. Morison, Sloan Fellows Professor of Management, in the foreword to a new book of Dr. Stratton's collected addresses.

"In so doing, he has not produced an all-inclusive, neatly dovetailed, logical system, but he has described most of the essential things we have to think about in trying to order our present experience, and he has given us useful and wise ways to think about them," Professor Morison writes.

"It is a considerable achievement."

Twenty-three of Dr. Stratton's addresses (many of them earlier printed in *Technology Review*) have now been collected and published under the title *Science and the Educated Man* (M.I.T. Press, 1966, \$5). They range from re-



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marks at M.I.T. convocations and private meetings to principal addresses before national public and scientific groups. Their common meeting ground, as the title emphasizes, is the growing impact of science and engineering upon themselves and upon the life and times of men in other professions and cultures. The central theme is clearly sounded in the title address: "We must allow no gulf to grow between scientists and the great body of educated people. The education of scientists and engineers is now too serious a matter to remain wholly the concern of the profession itself. The liberal education of all people is a matter of equal moment to us as scientists."

There is also in the book broad evidence of Dr. Stratton's devotion to M.I.T. As Professor Morison notes, Dr. Stratton came to M.I.T. "with the idea that he 'would stay a little while'." But a "compelling force" held him close to the Institute for over 40 years, and "over these years a strange mixture of feelings he had known as an undergraduate developed into 'a consuming devotion,' Professor Morison writes.

Now, though he has gone from Cambridge to become chairman of the Ford Foundation, Dr. Stratton maintains an office at M.I.T. *Science and the Educated Man* supplements his occasional Cambridge visits in giving the Institute community continuing evidence of his presence, devotion, and wisdom.

Engineering Programs

Three programs of the M.I.T. Center for Advanced Engineering Study are now open for application:

- The Practicing Engineer Advanced Study Program for 1967-68.
- A special three-week summer program in Probabilistic Methods, scheduled for June 13-30, 1967.
- A Civil Engineering Materials Workshop, to be conducted from July 10-21, 1967.

Harold S. Mickley, '46, CAES Director, describes the Practicing Engineer Advanced Study Program as "an intensive academic experience that can add totally new dimensions to each participant's professional qualifications" in science, engineering, or management. It is planned, he says, to give experienced engineers, applied scientists, and engineering managers a chance "to work in depth in technological areas pertinent to their professions, using all the resources for education and research in technology available throughout M.I.T."

The Practicing Engineer Program is a full-time post-graduate program arranged in sessions which coincide with M.I.T.'s regular semesters, and enrollment is available for either or both of the regular terms of the 1967-68 aca-

demic year and for a series of special review subjects given in the summer.

The summer program in Probabilistic Methods is planned "to develop an understanding of the relevant fundamentals and their consequences," according to Alvin W. Drake, '57, Associate Director of the M.I.T. Operations Research Center, who will direct the work. Those who enroll will learn, he says, "the fundamental methods of probabilistic modeling and analysis" and will "develop a more critical attitude towards matters of statistical inference;" the prerequisites include an undergraduate degree in engineering or science and a working knowledge of elementary calculus through integration in several dimensions.

The Civil Engineering Materials Workshop, under the direction of Frederick J. McGarry, '50, Professor of Civil Engineering, will provide study and discussion of materials teaching and research in civil engineering. "Significant advances in materials science," says Professor McGarry, "now permit a better understanding of the relationships between internal structure and composition and the macroscopic properties of structural materials." The result, he says, is that engineers now have better control over present materials and have new leads to follow in the development of new materials to better meet engineering needs. The Workshop is planned especially for faculty members who are teaching materials science or engineering to civil engineering students.

Further information and applications are available from the CAES, Room 24-417, M.I.T.

It's a new use for the Alumni Pool, a February celebration of the approach of spring to New England . . .

Institutional Studies

Dean L. Jacoby, '54, has been appointed director of the M.I.T. Office of Institutional Studies, which provides computer services to a number of administrative offices at the Institute including Admissions, Alumni, Registrar, and Student Aid. Robert E. Holz, '58, who has been acting director, will continue as associate director with primary responsibility for the systems design and computer functions of the office.

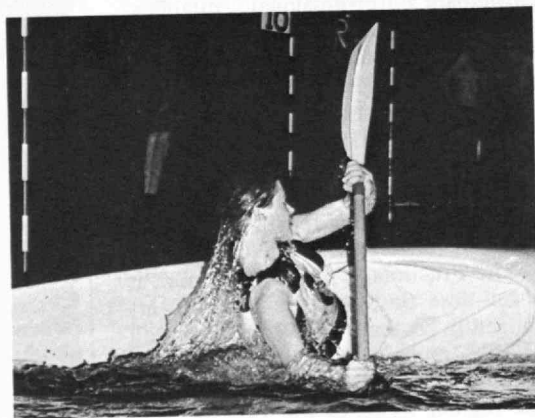
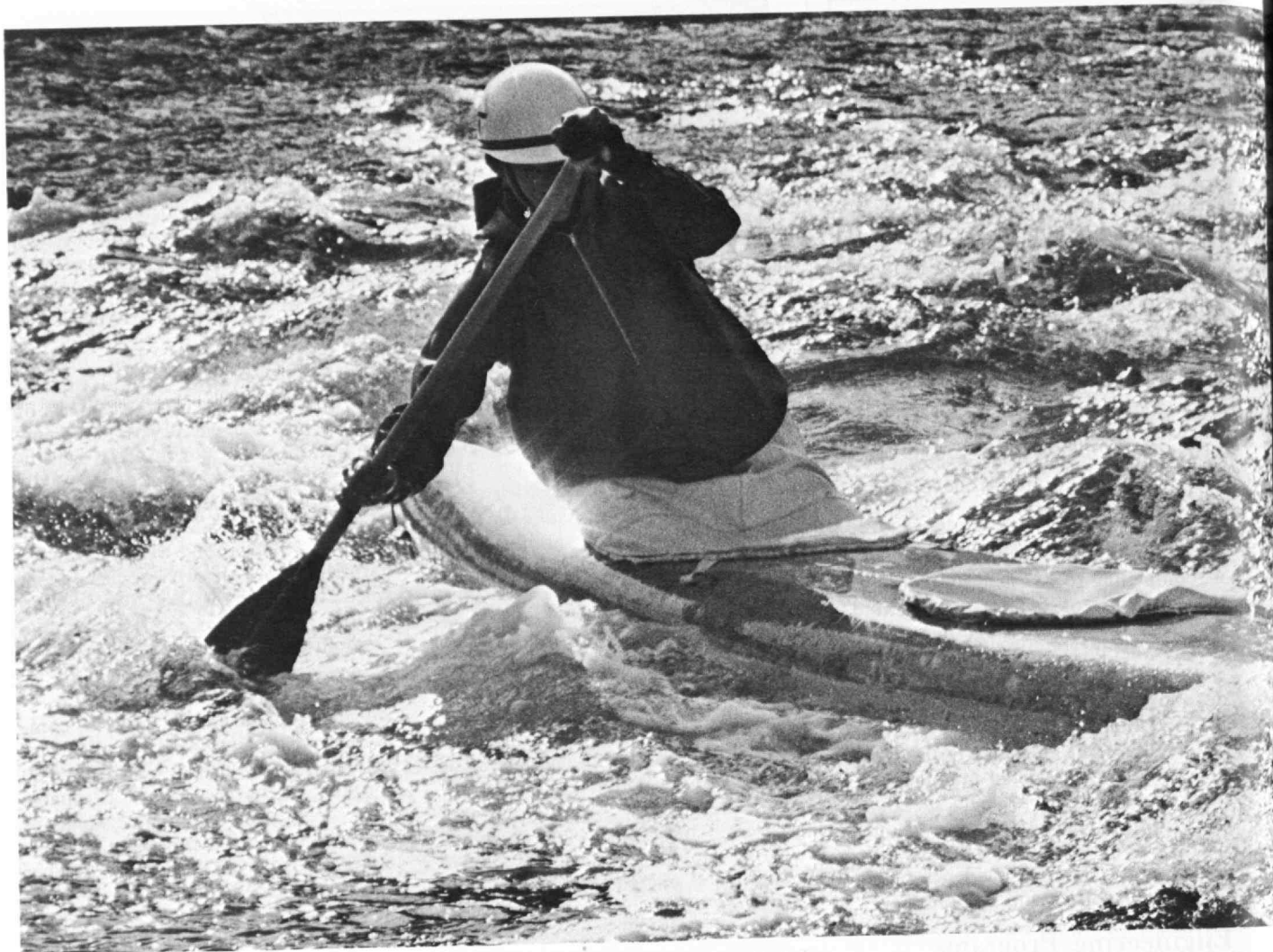
Mr. Jacoby came to M.I.T. in 1964 as assistant director of the Student Aid Center and general manager of Technology Student Enterprises, Inc. He became associate director of Student Aid in 1965. As a student, he was president of the M.I.T. Undergraduate Association; he was president of the Class of 1954 for five years following graduation and has been class agent since 1959. From 1961 to 1963 he served on the Corporation Visiting Committee for Student Affairs.

Scientist-Astronauts

Seventeen members of the M.I.T. community—eight members of the faculty and nine research staff—have applied for assignment as scientist-astronauts with NASA. The National Academy of Sciences, which is processing the applications, says it is the largest number from any single educational institution in the U.S. Harvard is second with 12 applicants and Ohio State third with 11; in all, 945 scientists and engineers submitted applications. The final selection process is underway by NASA, with an announcement of the results expected in midsummer.

PHOTO: JEFFREY M. REYNOLDS, '68





Spring Sports

A busy two months of spring sports began at M.I.T. late in March, and Briggs Field and the Charles River will be in continuous animation.

Principal home varsity events on the schedule include: baseball vs. Wesleyan April 8, vs. Tufts April 19, vs. Middlebury April 22, vs. Bates April 28, vs. Brandeis May 16 and vs. Northeastern May 20; crew vs. Boston University and Northeastern April 8 and vs. Columbia April 15; track vs. Colby April 8, vs. Bowdoin April 29, at the Greater Boston tourney May 3, and vs. Tufts and Boston University on May 11.

The sailing team will compete on the Charles River for the Geiger Trophy on April 9, the Owen Trophy on April 22-23, the Monotype Championships on May 6-7, and the New England Championships on May 13-14.

The heavyweight crew will row for the Compton Cup at Harvard on April 29, the Cochrane Cup at Madison, Wisconsin, on May 6, the eastern sprint regatta at Worcester on May 13, and the intercollegiate Rowing Association Regatta at Syracuse on June 17.

Seminar on Urban Crisis

The 1967 Alumni Seminar, at M.I.T. on September 8 through 10, will be devoted to the topic of Cities in Crisis.

Plans are now being completed by a committee of which Irwin W. Sizer, head of the Department of Biology, is chairman. Associated with him in planning the program are Lawrence B. Anderson, '30, Dean of the School of Architecture and Planning; Robert L. Bishop, Dean of the School of Humanities and Social Science; Charles L. Miller, '51, head of the Department of Civil Engineering; Carroll L. Wilson, '32, Professor of Management; Donald P. Severance, '38, Executive Vice-president of the Alumni Association, and Frederick G. Lehmann, '51, Alumni Secretary.

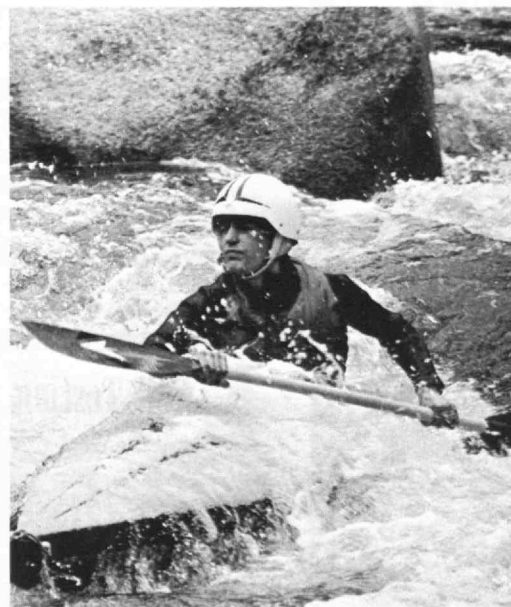
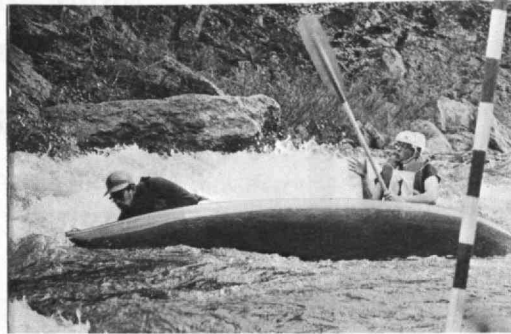
The seminar plan derives from "M.I.T.'s deepening concern for the urban environment in which we find ourselves." The plans for the seminar include lectures, discussions, and exhibits covering the history of cities, man's adjustment to urban life, urban development, communications and transportation, education, religion, law, art, culture, and architecture.

The size of the seminar will be limited to 400, to assure that all members may participate fully, and applications are now being accepted by Mr. Lehmann.



PHOTOS: JOHN URBAN

... by Thomas G. Wilson, '68 and his colleagues in the M.I.T. White Water Canoe Club. Tom's deliberate dunking (previous page) was part of the Club's New England Slalom, in which he (left) out-performed all the competition, including a more decorative entry from the University of Vermont. Other pictures were made on last year's Club expeditions to a tidal chute at Cohasset (Tom Wilson and friend, above); the Swift River in New Hampshire (Edward Mattison, physics graduate student, and friend, left, and Samuel Galpin, '66, right); and to the West River, Vermont, where Tom Wilson and friend missed a cue and tested their wet suits. Proved swimming ability, life preserver, and helmet are Club rules. M.I.T. will enter the national championships at Jamaica, Vt., this spring and Tom Wilson is already looking toward the world championships in Czechoslovakia this summer.



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An Institute Gazette

19-4, 9-3, 8-2

Winter sports 1966-67 at M.I.T. is the story of three teams: basketball, swimming and wrestling.

After a 19-4 season, the varsity basketball team thought it might be a candidate for the NCAA regional tournament; no M.I.T. team has ever made it, but Coach John G. Barry's squad was clearly the best ever, and 19 wins is an all-time record. But no bid from the NCAA.

The varsity swimming team had a 9-3 season during which every Tech varsity record on the books was wiped away. Lee A. Dilley, '69, broke the 200-yard butterfly record twice, once (2:12.8) at Trinity and later (2:12.0) at Brown. Michael A. Crane, '67, set two new records (50- and 100-yard freestyle) in a single meet; and in the same meet (against Massachusetts) John L. Preston, Jr. '68, and Luis A. Clare, '69, set records in their individual events and then teamed up to break the 400-yard medley relay mark.

The wrestling team went into the New England intercollegiate tournament with a season record of 8-2; David N. Schramm, '67, who was un-

defeated in 10 starts during the season, figured to retain his New England championship and hoped for company at the top.

The freshman wrestlers, which *The Tech* called the best in M.I.T. history, won the New England championship, and three of them ended the season with perfect records.

The M.I.T. squash team surprised all the experts by placing ninth in the national tournament after a disappointing 5-11 season.

Technology Ascendant

Two M.I.T. Alumni are among 28 members of the Program for Senior Executives at the Sloan School of Management during the current spring term.

They are Barry M. Bloom, '48, director of medicinal chemicals research for Chas. Pfizer & Co., Inc., Groton, Conn., and Henry A. Leone, '48, manager of the Scientific Equipment Department at the Westinghouse Research and Development Center, Pittsburgh.

But a more unusual fact about the 28 executives who are spending nine weeks at M.I.T. this spring is this: 3 of them hold doctorates in science or engineering fields, five more hold master's degrees in these fields, and in all 18 of them took their undergraduate

college majors in a technical field.

As members of M.I.T.'s program for "middle" managers, they will be following a full-time interdisciplinary study of business functions, supporting elements, and the economic, social and technological environment of the firm while in residence at M.I.T.'s Endicott House.

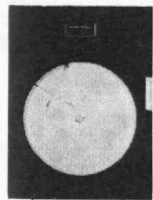
Growing Pains

Though the building is only two years old, M.I.T. student activities have already outgrown the new Student Center.

The activities floor is full, and now the Student Center Committee and the Activities Executive Board are completing a survey to find out just how serious the problem is. Data has been collected, according to *The Tech*, on the number of people in different activities at different times during the week, month, and year, the equipment used, their estimated future needs, and other details pertinent to space planning. The result will be a report of short- and long-range goals, showing how the present space can be best used and suggesting the dimensions of the future problem.

No one holds out much hope for the allocation of additional space elsewhere for new activities which cannot now be quartered in the Student Center. Orig-

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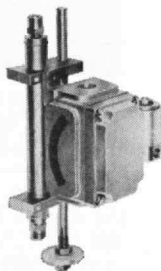
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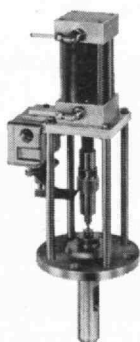
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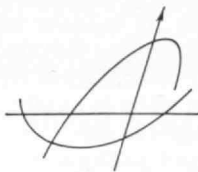
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An Institute Gazette

inally it was hoped that the fifth floor might be devoted to student activities when more space was needed, but that space is now occupied by an overcrowded reading room.

The committee is also considering space which may be available in the adjacent Kresge Auditorium building and in Walker Memorial, the original student center which was vacated by most student activities when the Stratton Building on the west campus was completed.

But *The Tech* adds a word of warning: "Reports are only of value if the proper people read them and decide to act."

Halberds and Pikes

The last castings made in the Metals Processing Laboratory foundry this winter are about to be put in place at Fort Washington, a small park just behind M.I.T. which preserves one of the few remaining earthworks from the Revolution.

The foundry has now been closed, a victim of the changing patterns of engineering education.

Its last products were halberds and pikes to replace missing palingheads in the fence around Fort Washington. The molds for the new parts were made by Rindge Technical High School (Cambridge) students, who also helped with the foundry work at M.I.T.

The fort was built in November, 1775, by George Washington's Continental Army, part of a ten-mile containment ring which effectively prevented the British from breaking out of Boston.

The restoration of the fence is the beginning of a dream in the mind of Douglas P. Adams, associate professor of mechanical engineering at M.I.T., who is chairman of the executive committee of the Massachusetts Revolutionary War Bicentennial. He is leading a project to restore and bring public attention to little-known Fort Washington.

To Break with the Past

Boston continues to plan for gas-turbine-powered demonstration trains to New York on 3 1/4-hour schedules by mid-summer, but William W. Seifert, '47, assistant dean of the M.I.T. School of Engineering, doubts their value as a test of the public reaction to improved surface transportation or as a reasonable solution for BosNyWash transit needs.

Instead, said Dean Seifert at a Boston College Bureau of Public Affairs



The smoking casting in the foreground of the M.I.T. foundry is a halberd for the fence surrounding Fort Washington; in the background are the Rindge (Cambridge) High School and M.I.T. students and teachers working with Douglas P. Adams of the Mechanical Engineering Department to restore the city's pride in its almost-forgotten historical site.

Seminar, the results of these trials may be so inconclusive that they will put a crimp in the whole high-speed transportation program.

We need a much broader "break with the past," he declared, a far more revolutionary approach to intercity travel. "The question is how to really jump ahead" with much more exotic experimental systems, and it is such systems as air-cushioned guideways and pneumatic tubes that seem to him and his M.I.T. colleagues to have the only long-range promise for megalopolitan transit, Dean Seifert said.

All Are Welcome

Every seam at M.I.T. will be bulging on April 22 from an influx of visitors which may number as many as 30,000.

Three concurrent events are expected to pull in the record audience:

The Massachusetts Science Fair, sponsored jointly by M.I.T. and the Boston *Globe*, will occupy Rockwell Cage on April 21, 22, and 23, with a final ceremony for awarding prizes mid-afternoon on Sunday, April 23. Several hundred high school students will bring their displays to the Cage for the three-day event, and the exhibits will range from computers and high-energy accelerators to the genetics of growing plants.

M.I.T.'s biennial Open House is set for April 22, from noon to 5 p.m., when at least 20,000 Greater Boston residents will troop the halls to see experiments and demonstrations in every department. There will be special events at the nuclear reactor and the Computation Center, and the Institute's many computers arranged for easy man-machine communication are likely to be the stars of the show. There will be no admission charges; even refreshments provided by the Association of Women Students will be part of M.I.T.'s hospitality to the community in which it lives. Alumni, parents, and high school students and their teachers are especially invited.

At least 2,000 Explorer Scouts from throughout New England are expected to tour the Institute in a special hospitality program arranged by M.I.T.'s chapter of Alpha Phi Omega, the national service fraternity, on Saturday morning before Open House.

Music in Niagara Falls

Two music scholarships named for M.I.T. have resulted from the M.I.T. Concert Band's appearance in Niagara Falls, N.Y., during its inter-session tour.

The band performed in Niagara Falls under the auspices of the local Kiwanis Club music festival for an audience of about 1,000, and its members brought home a plaque commem-



An "appreciation award" has been given by the Western Electric Fund to M.I.T. "in recognition of outstanding efforts in furthering academic excellence and significant contributions toward meeting the educational needs of a free society." The award, including a \$5,000 check, is for the work of the Physical Science Study Committee in developing a new high school physics course. At the presentation ceremony were Bruce Harriman, vice-president (public relations) of the New England Telephone and Telegraph Co.; Jerome B. Wiesner, M.I.T. provost; Jerrold R. Zacharias, Institute professor and professor of physics who founded P.S.S.C.; and J. W. Abbott, Jr., manager of Western Electric's Watertown operations.

orating their "excellent performance and contribution" to the festival. The proceeds of the concert will help two outstanding elementary or high school musicians from the Niagara Falls area finance further study in music, and John D. Corley, director of the Concert Band, will go to Niagara Falls in May to present the awards.

"Mixed Nuts"

VooDoo's "mixed nuts" issue went on sale in February, to the accompaniment of a special demonstration by Harold Federow, '70, Walter J. Kuleck, Jr. '67, and Wesley F. Moore, '70, of the *VooDoo* staff on how to use a "5.01 non-returnable kit." Here is *The Tech's*

account of the affair in the Building 10 lobby:

"They showed that the overabundance of paper in the kits can be transformed into a screen door or used to cut commons rolls. The plastic bottle can be fastened to some rubber tubing and, with the addition of an illegal hot plate and some ice, will make a very adequate still. The same plastic bottle can be attached to some glass tubing by a rubber hose to make a handy projectile launcher.

"To culminate the demonstration, the staffers presented a lamp built from a liter bottle with a little Tech engineering and a lampshade made from more paper from the 5.01 kit."

Dr. James R. Killian, Jr., '26 (extreme left), Chairman of the M.I.T. Corporation, was a special guest at the year's fourth meeting of the Alumni Fund Board. Dr. Killian discussed M.I.T. financial needs and details of fund operations with (clockwise from him around the table) Philip H. Peters, '37, Chairman of the Fund Board; Kenneth S. Brock, '48, Director of the Fund; Donald A. Hurter, '46; Edward O. Vetter, '42; D. Reid Weedon, Jr., '41; Thomas H. West, '22; Douglas F. G. Haven, '52, Associate Director of the Fund; and T. Guy Spencer, Jr., '56, Assistant Director of the Fund.



An Institute Gazette

Individuals Noteworthy

Thomas C. Bartee, who has worked on the switching theory, the information theory, and the design of digital computers at Lincoln Laboratory since 1956, is now director of the Electronics Design Center at Harvard University.

Former U.S. Senator **Ralph E. Flanders**, emeritus life member of the M.I.T. Corporation, is now on the directors' advisory council of the National Life Insurance Company of Vermont.

Howard W. Johnson, President of M.I.T., has been appointed by Governor John A. Volpe to a three-year term on the Massachusetts Housing Finance Agency, a unit of the Department of Commerce and Development charged with financing low-cost housing.

Charles G. Overberger, Dean of Science at the Polytechnic Institute of Brooklyn and who did post-doctoral work at M.I.T. in 1946, is now president of the American Chemical Society.

The Institute of Electrical and Electronics Engineers has awarded the Medal of Honor to **Charles H. Townes**, Institute Professor of Physics, for "his significant contributions in the field of quantum electronics which have led to the maser and laser"; the Founders Award to **Harvey J. Fletcher**, '44, "for his creative contributions to the science of physical acoustics, electrical engineering, and for his management skills in the operation of a leading research laboratory"; and the Browder J. Thompson Memorial Prize to **Ronald A. Rohrer**, '60, for his paper, written jointly with L. O. Chua, entitled "On the Dynamic Equations of a Class of Nonlinear RLC Networks." Other recent honors for Dr. Townes include an honorary doctor of laws degree given by the University of Alberta at its Centennial Convocation and his election to the presidency of the American Physical Society.

Jerome B. Wiesner, Institute Provost, has been elected a director of the New England Electric System.

Victor F. Weisskopf, Head of the M.I.T. Department of Physics, is chairman of a new panel on high-energy physics organized by the Atomic Energy Commission to provide the AEC with "advice and guidance in this area of physical science research."

The Boston Rotary Club presented **David Stern**, '13, with its annual service award.

"The 104," a film made by **Oscar H. Horovitz**, '22, was chosen one of the five best films of 1966 by the Amateur Cine Society of Melbourne, Australia.

Charles A. Thomas, '24, Chairman of the Board of Directors of Monsanto Company, has been chosen "Man of the Year" by the St. Louis *Globe Democrat*.

Arthur F. Merewether, '25, received the Cleveland Abbe Award for Distinguished Service to Atmospheric Sciences by an Individual from the American Meteorological Society.

Charles S. Draper, '26, head of the Department of Aeronautics and Astronautics, has been designated the Daniel Guggenheim Medal recipient for 1966; the award was given by the American Institute of Aeronautics and Astronautics. Dr. Draper, **Hunter Rouse**, '29, and **Ray W. Clough**, '47, are members of the newly-formed joint National Academy of Sciences-National Academy of Engineering advisory committee.

Willard F. McCornack, '26, is now executive officer of the U.S. Geological Survey.

Albert S. Dempewolf, '28, is now publisher of *Motor* magazine.

David Graham, '29, partner in Hornblower and Weeks-Hemphill, Noyes, has been elected to the board of directors of Olinkraft, Incorporated.

St. George T. Arnold, '30, is now director of the Operational Planning and Power Division of the Atomic Energy Commission's Oak Ridge Operations.

Donald A. Holden, '31, chairman and president of the Newport News Shipbuilding and Dry Dock Company, has been elected president of the Society of Naval Architects and Marine Engineers.

Lawrence G. Mohr, '31, has been named area manager of the Atomic Energy Commission's new proton accelerator project at Weston, Illinois.

Manson Benedict, '32, head of the Department of Nuclear Engineering, received the Founders Award of the American Institute of Chemical Engineers for his "pioneering work in applying the principles of chemical engineering to the field of nuclear energy . . ."

Arthur G. B. Metcalf, '32, is now chairman of the President's Council of Franklin Pierce College.

John G. Trump, '33, professor of electrical engineering at M.I.T., has received the New England Award of the Engineering Societies of New England for his contributions in the development of high-energy accelerators and their application.

Leo F. McKenney, '36, is product



C. G. Overberger



D. Graham, '29



S. T. Arnold, '30



H. N. Wallin, '37



L. A. Kiley, '39



F. J. Bittel, '40



T. F. Jones, '40



R. C. Winkler, '45



J. F. Hennessy, '51



N. P. Blake, '56

evaluation manager at the Research and Development Center of Lever Brothers Company.

Charles R. Milone, '36, is now director of general products development for The Goodyear Tire and Rubber Company.

Rear Admiral **Harry N. Wallin, '37**, is commander of the Naval Facilities Engineering Command's Atlantic Division.

Harold Chestnut, '39, Manager of the Systems Engineering and Analysis Branch, Research and Development Center, of the General Electric Company, and **Edward E. David, Jr., '47**, Executive Director of Research, Communications Systems Division of Bell Telephone Laboratories, have been elected directors of the Institute of Electrical and Electronics Engineers.

Herbert K. Cummings, '39, has been elected chairman of the board of Gourline Systems, Incorporated.

Hugh F. Kennison, '39, is now president and chief executive officer of International Pipe and Ceramics Corporation.

Leo A. Kiley, '39, commander of the Air Force Missile Development Center at Holloman Air Force Base, N.M., has been nominated by President Lyndon B. Johnson for the permanent rank of brigadier general.

Francis J. Bittel, '40, is now assistant general sales manager of The Youngstown Sheet and Tube Company.

In his capacity as Assistant Secretary of Commerce for Science and Technology, **J. Herbert Hollomon, '40**, accepted for his department the 1966 Industrial Science Award given by the American Association for the Advancement of Science. Upon the resignation of John T. Connor, Mr. Holloman was named Under Secretary of Commerce.

Thomas F. Jones, '40, since 1962 president of the University of South Carolina, was selected "South Carolinian of the Year" by WIS (radio and television) of Columbia, S.C.

Claude E. Shannon, '40, Professor of Electrical Engineering and Mathematics, was awarded a National Medal of Science by President Lyndon B. Johnson for "developing theories of communications and information processing."

William K. Hooper, '41, is now executive vice-president of Republic Foil Incorporated.

George F. Quinn, '41, Assistant General Manager for Plans and Production for the Atomic Energy Commission, received a Distinguished Service Award from the AEC for his "outstanding contributions to Commission programs."

Albert C. Zettlemoyer, '41, is Le-

high University's first vice-president for research; he has taught at the institution for 25 years.

Virgilio Barco-Vargas, '43, is now mayor of Bogota, Columbia.

Irene du Pont, Jr., '43, an M.I.T. Corporation member, was elected a vice-president and member of the executive committee of E. I. du Pont DE Nemours & Company. He fills the executive committee position vacated by the retirement of **Robert L. Hershey, '23**.

Donald A. Ostrower, '45, a partner in the firm of Vollmer Ostrower Associates, is now president of the New York Association of Consulting Engineers.

Richard C. Winkler, '45, is a vice-president of Container Corporation of America.

Chiao Jen Wang, '46, will head the Office of Advanced Engineering recently established by the Advanced Research Projects Agency of the Department of Defense.

AMSTED Industries has named **James Woodburn, '46**, a corporate vice-president; he will be in charge of Griffin Wheel Company and Griffin Steel Foundries, and will continue as president of AMSTED Research Laboratories.

Carl E. Dengler, '47, formerly Director of E. I. du Pont de Nemours & Company's Yerkes Research and Development Laboratory, is now that company's product manager with responsibility for "Clysar" polyolefin film in the manufacturing division of the Film Department.

William A. Lockwood, '48, is now senior vice-president of the First National City Bank of New York, Specialized Industries Division.

Peter J. Cambourelis, '49, is manager of program development of scientific satellites at Avco Space Systems Division.

Constantine J. Lahanas, '50, is now director of sales promotion at General Radio Company. He succeeds **Charles E. Worthen, '28**, who has retired.

John F. Hennessy, Jr., '51, is now president of Syska & Hennessy, Incorporated, consulting engineers; he replaces **John F. Hennessy, Sr., '24**, Co-founder and President since 1928, who is now chairman of the board.

Robert C. Duncan, '54, formerly Chief of the Guidance and Control Division at the NASA Manned Spacecraft Center, is now assistant director for guidance and control research in Cambridge.

Norman P. Blake, '56, is now senior vice-president of traffic and sales for Pan American World Airways.

William G. Kay, Jr., '63, is now president of the Rival Pet Foods Division of Associated Products Inc.

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If you work in the sun, watch it. Day after beautiful day of sunshine can result in overexposure. This is a form of radiation that can lead to skin cancer. So cover up in the sun. And remember that a yearly health checkup is your best insurance against cancer. Call your doctor for an appointment today.

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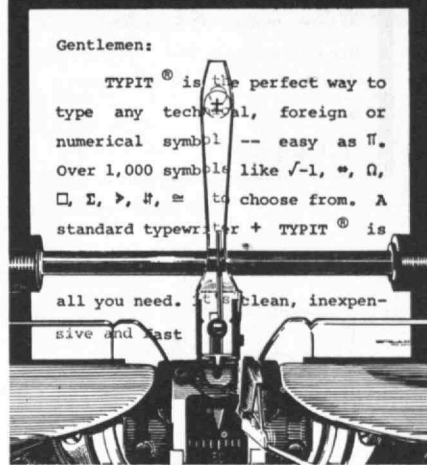
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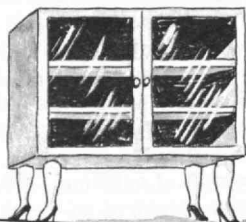
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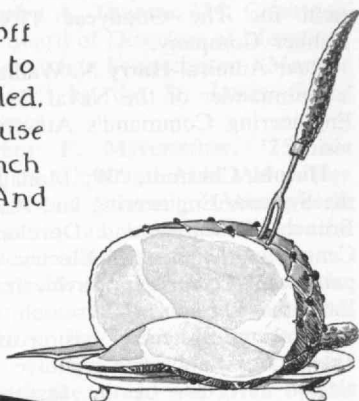
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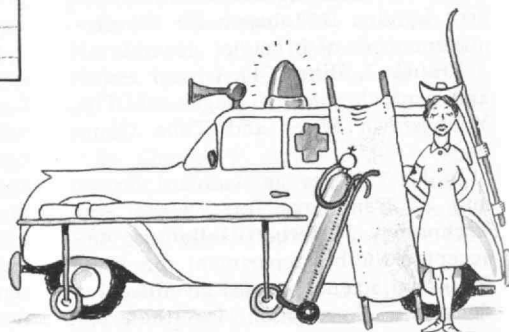
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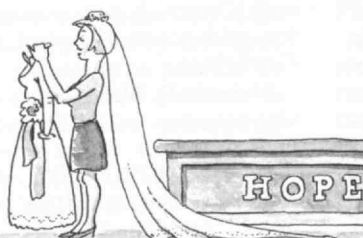
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Four presentations of four aspects of the problem — then smaller discussion groups followed after lunch by an open panel discussion led by Provost Jerome Wiesner.

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P.S. Your ladies will have plenty to do and we hope they'll be with you. The seminars and activities have been planned with them in mind.

If your class year ends with 2 or 7 you'll be reunioneing nearby on June 10th and 11th. So winding up at M.I.T. on the 12th is a *must* — particularly if you haven't returned in the past 5 years.

'96

Herbert D. Newell, 4837 East Tyler Street, Fresno 2, Calif., has written a letter acknowledging receipt of a Christmas card "which indicates you are still living." The letter says that though some of his senses are not what they used to be, he still goes through the motions with a shovel and hoe to get rid of Bermuda grass; he rates himself as an inefficient workman. He skims through the daily newspaper—reading some of the sports, not overlooking the performance of Cassius Clay as he floors one challenger after another. . . . Dorothy and **Will Coolidge** did not drive but flew to Siesta Key, Sarasota, Fla., one of the best beaches in the state, for a two-month stay. They feel quite at home in the same apartment they have had for the past five years. . . . Mrs. Davis has left her old home in Waltham and is now very comfortable at the Charlesgate Manor in neighboring Waverlytown. Over the phone she expressed pleasure in getting a letter of sympathy from Will Coolidge, a classmate of Bob's in Course VI. Charity is giving; some new texts use instead the word love. If one could appreciate how happy the recipient's voice sounded, one might heed the admonition, "Go thou and do likewise."—**James M. Driscoll**, Secretary, 129 Walnut Street, Brookline, Mass.

'97

Our active member, **Will Binley**, recently sent the welcomed quoted letter indicating prolonged youth not only in his activities, but in his handwriting as well. Other '97 members should emulate him. "I was fortunate in passing the required eye test last summer for a renewal of my drivers license. I found I was number four on the list of old drivers in New Hampshire. The license being good for two more years, I took off alone on December 1 last for Florida via Washington, D.C., and Nashville, Tenn. While spending a month on the Florida east coast and Nassau, I had a pleasant visit with Lyman Hewins, '98, who was living on his yacht *Nenemosha* at Ft. Lauderdale. I am now on the west coast of Florida where I find many old friends. I did attend the Alumni Day luncheon last June, but I find it quite disappointing to be the only one from '97. Where are the others? I was overwhelmed to learn of the great class gifts and the massive plans for the future of Tech. It seems like a different world from that of '97. I do hope you are still able to get around. I shall try to look you up on my way home in March." Thank you, Will.

Yesterday came a notice of the passing of **Edward P. Brown**, Course III. The information was rather vague, as are too many such notices. Does anyone remember him or have his recent address?—

George R. Wadleigh, Acting Secretary, 70 Flower Avenue, Hastings-on-Hudson, New York 10706

'99

James Gerhard Leiper, Jr., II, was born on December 19, 1877. He was a retired lawyer and engineer. He was a director and on the executive committee of the American Meter Company and a member of the Rose Tree Fox Hunting Club. He was a graduate of the Massachusetts Institute of Technology 1899 and the University of Pennsylvania in 1905. His main interests in life were breeding race horses and fox hunting with the hounds. In fact he rode each morning until two years ago. In summer he proved to be a very capable sailor on Barnegat Bay in New Jersey, and owned several large sailing yachts. He was active until about 10 years ago. As usual I received a handwritten note of thanks for his birthday card. On his Christmas card he wrote, "From your note I observe you are still going strong; I wish I could say the same." James died December 29, 1966, at his home on Meadowbrook Lane in Philadelphia at the age of 89 years. Surviving him are three daughters, Mrs. C. Paul Denckla, Mrs. Martin H. Rittenhouse and Mrs. Daniel P. Brewster, and eight grandchildren.—**Percy W. Witherell**, Secretary, 1162 West St., Wrentham, Mass. 02093

'01

Most of the news continues to be a report of classmates who have died. However, I can give you some news of a classmate you will all remember, **John T. Scully**. He had a stroke about 16 or 17 years ago and he has been living with his son in Las Vegas, Nev. For the last two years he has been practically bed-ridden but has the will to keep punching like all good bean eaters. He talks a good deal about his classmates. He was a great friend of John F. Fitzgerald and knew all the family very intimately. He was much interested when Kennedy was president and watched all the details of his death. He remembers many of his classmates and would be pleased to hear from them. His address is 120 South Third Street, Las Vegas, Nevada. He would be delighted to hear from any of his classmates who cared to write.—**Theodore H. Taft**, Secretary, 34 Lawrence Street, Jaffrey, N. H. 03452

'02

Through a letter received from the Alumni Office it is learned that **George E. T. Eagar** died in Miami Shores on December 13, 1966, at the age of 86. This item was not received in time to be included in the March notes. Eagar was with us one year and then entered the employment of General Electric as a draftsman

Happy Birthday

In April there are only 14 Honor Roll birthdays. This month three alumni will reach 90, six will reach 85, and five will reach 80.

April, 1877—**ETHEREDGE WALKER**, '99, on the 11th; **NORMAN E. SEAVEY**, '99, on the 12th; **GEORGE H. LEACH**, '00, on the 14th.

April, 1882—**JAMES E. ROGERS**, '05, on the 6th; **HARRY P. CHARLESWORTH**, '05, on the 7th; **HAROLD C. EDDY**, '07, on the 19th; **EZRA E. WOODBURY**, '05, on the 20th; **R. C. JORDAN, Sr.**, '03, on the 25th; **THOMAS F. HICKERSON**, '09, on the 30th.

April, 1887—**GEORGE E. GOODSPEED**, '10, on the 16th; **RUSSELL HASTINGS**, '10, on the 20th; **HARRY S. ALEXANDER**, '11, and **W. FRED DOLKE**, '08, on the 28th; **HOBART W. FRENCH**, '08, on the 29th.

on Railway Control apparatus in November 1899. A year later he was transferred to the Atlanta office and the following April was back in Schenectady as a draftsman. In November 1901 he shifted to the Testing Department, then to the Construction Department, and later to the Railway Engineering Department. As a specialist in automatic control for industrial purposes, he traveled extensively through the Middle West and western states giving lectures on that subject to G.E. salesmen. In 1912 he became Engineer of the Building Equipment Department of the Sprague Works of the General Electric Company, and his goal was to introduce the company's line of electrical apparatus to architects, engineers, contractors and builders. For his health's sake two years later he took up outdoor life. As he was familiar with the Adirondacks he was able to fit into the summer camp activities as superintendent of a camp or as a guide or counsellor. He made Ballston Spa his home spot and sometime later in 1918 set himself up in business there in a small way as electrical contractor and dealer. Upon retirement 20 years ago he volunteered and received a temporary appointment as forest ranger for the Seventh Lake area of the Fulton Chain, 14 miles from Old Forge. There he spent four months of each year for 20 years. He resigned last year, but as no one could be found to take his place he stayed on for the summer of 1966. He had wintered in Florida since 1952 and went there last fall to make it his year-round home. In Ballston Spa he had been active in community affairs and was past president of Rotary and had been elected to honorary membership every year after retiring from business. He was a member of Chi Phi Fraternity. He leaves his wife Florence, children and grandchildren.—**Burton G. Philbrick**, Secretary, 18 Ocean Ave., Salem, Mass. 01970

'03

A note of historical interest to all of our M.I.T. alumni should be the passing away last June of Dr. William Welles

Bosworth, the designer of our first and striking group of buildings with prominent campus fronting the Charles River, Cambridge. This event was an epoch in the future expansion of our M.I.T. development, from its modest group of few buildings on Boylston Street, Boston, as fostered by its industrious and devoted founder, William Barton Rogers. Dr. Bosworth was born in Marietta, Ohio, 1869, and after completing his scholarship in local schools entered M.I.T. to graduate in architecture with the class of 1889. He then studied at Ecole des Beaux Arts at Paris, where he acquired his masters and doctors degrees. His major work in America was accomplished at his studio on Fifth Ave., N.Y., where he designed the American Telegraph Company Building in New York, many private residences and the Major L'Eufant Monument in Arlington National Cemetery. His interest then moved to France after World War I to supervise restoration of the Fontainebleau Chateau and the Reims Cathedral. The restoration of Versailles Palace was accomplished under a grant by John D. Rockefeller, Jr. Following World War II Dr. Bosworth established a committee to raise funds to rebuild the town of Vimontiers, France, which was bombed reportedly by accident by Allied planes. A square was subsequently named in his honor there. He left a wife and four daughters. Funeral services were held at the American Cathedral in Paris.

A new honor for M.I.T. President, Howard W. Johnson, is his being recently appointed by the Board of Governors of the Federal Reserve System as a Class C. director of the Federal Reserve Bank of Boston for a three-year term beginning January 1.

The average person today upon noting the title of engineer assumes strange ideas as to its meaning and rightfully so, for the early professed engineer took his transit and entered the wilderness with great courage to face his uncharted course. Engineers and professionals even today may wish that they had some of that early 19th Century glamour, as their interests including space and electronics are not lacking in allure. Accordingly the National Society of Professional Engineers (N.S.P.E.) has opened a public relations campaign to bring home to young people its attractions and opportunities. Although what the engineer does intimately affects the lives, work and happiness of every single American, because the house he lives in, the water he drinks, the furniture he uses, the machines that make his life easier, his transportation and much else, are products of the engineer's art, he does not deal with the individual directly and personally as does a medical doctor or lawyer. Unlike the scientist who seeks to understand nature and enlarge knowledge as an end in itself, the engineer puts scientific principles to practical use. Accordingly, present applications of scientific knowledge are bringing us to the threshold of interplanetary communications, mining the seas, setting up systems, putting manned expeditions on the moon and probing with powerful radio telescopes past the

fringes of the unknown universe. In past periods an engineering triumph could be achieved by a single inspired mechanic, but today's engineering demands have become so complex it is no longer possible for any one person to understand all the parts in a single device. The development of systems engineering—the organization of separate functions into an integrated whole that will work together to achieve one desired objective, has solved that problem. Chemical engineers devise the intricate processes and systems that produce a synthetic fibre, like nylon or uranium fuel elements for a nuclear reactor. Petroleum engineers, using the science of chemistry, develop systems and processes to develop a variety of by-products from petroleum. Mining engineers invade the earth and bring up valuable raw material and sources of power. Industrial engineers have the responsibility for plant lay-outs and design, work measurements, quality and production control, cost analysis, sales engineering and other industrial concerns. In transportation, engineering progress on land, sea and in the air has been dynamic. If engineering totaled in all its aspects can at last be coordinated, its whole technology will revolutionize all society.

Our deceased members are **Harold L. Norton, III**, of Tampa, Fla., and **Carl T. Bilyea, IV**, Atlantic City, N.J., January 20, 1966. . . . Our happy birthday greetings go to **J. Howard Pew, II**, of Philadelphia for his 85th milestone.—**John J. A. Nolen**, Secretary, 13 Linden Ave., Somerville, Mass.; **Augustus H. Eustis**, Treasurer, 131 State Street, Boston, Mass.

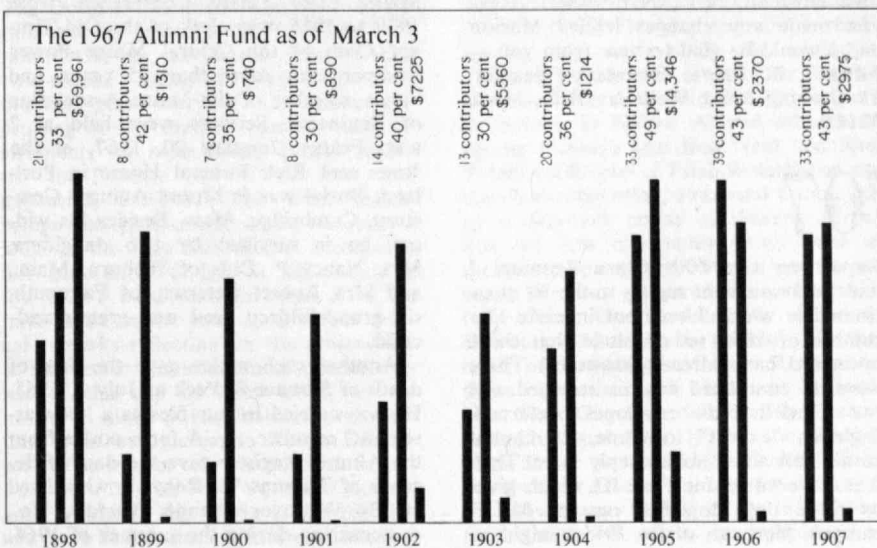
'05

Apparently most 1905 men exhausted their letter-writing capacity in sending me their Christmas annotations, for news is very scarce. However, I do appreciate the very satisfactory volume at Christmas time. . . . Perhaps I should have saved this letter for **Bob McLean's** next Fund appeal letter, but the material is so minor that I am using it instead of sending it to Bob. In going over some ac-

cumulated material, Elizabeth Babcock saved out and sent to me a Fund appeal letter written on April 16, 1906, by **Leonard T. Bushnell, II**. I think it is worth printing as it shows a well-developed class spirit existing within a year of our graduation. I quote: "Now that you are sucking the substance from a soulless corporation, how about showing a little loyalty to the Institute? We used to cuss at the place when we were there, but now that we are out in the real world we can feel nothing but affection for the school that fitted us to earn our present princely salaries. Yes and no? The merger with Harvard is dead and no one is willing to say a good word for it, but if it had gone through the financial future of the Institute would have been assured. And as I look at it, it is up to us Alumni to show that we are not four flushers by digging into our jeans and hauling up good red gold to help carry forward "the best school of all." The class of 1905 was never backward in pushing a good thing along and has come up finely, but some of us have let this matter get sidetracked. And for that reason I write to you and ask you to get busy with the enclosed card. None of us can support the Institute unaided, but we can all get in the procession to some extent. Give what you feel able to give, but if you feel that Tech has done anything for you, rally to her support by giving something." It certainly is good to realize that M.I.T. reached the top (and is still going higher) without the financial aid from Harvard. . . . **Albert E. Sweetser, II**, of Newton Highlands died on January 15, 1967. I have no further details. Al was with us for nearly three years, and attended several of our reunions at Old Lyme and Cape Cod. He was a member of our 1905 Relay Team—see 1904 Technique.—**Fred W. Goldthwait**, Secretary, Box 32, Center Sandwich, N.H.

'06

At the beginning of the March notes I told of receiving a card from Greece from **Henry Mears** and asked—where did you go (from Greece) Henry? Lo and



behold, who should telephone me on January 23 but Henry who was stopping off on his way home to Oregon to visit relatives in Cambridge. It so happened that the three class officers were to meet that noon with Kenneth Brock, Director of the Alumni Fund, and after conferring with **Sherm Chase**, he had me invite Henry to lunch with us. So he came in to the Prudential Tower and Vice-president **Stew Coey** came down from Wilmington, Vt. We were guests of Sherm at the Engineers Club there. The results of that conference with Ken Brock—about setting up a 1906 Memorial Fund—you have doubtless learned by the annual President's letter about the Fund. After lunch I took Henry and Stew up to the Skywalk on the 54th floor of the tower, and Henry was quite busy for awhile spotting familiar areas and buildings he knew 60 or more years ago. Much of Boston hasn't changed a bit—yet. . . . Several letters came in January. Mary Fletcher had seen a report in a Philadelphia paper that **George Burpee** had received an award from some American Trade Society at a meeting in the Sheraton there. . . . **Bob Cushman** and his wife Ruth have both been hospitalized, Ruth permanently I'm afraid, but Bob can drive his car to visit her. . . . **Leavitt Bent** and Alice had enjoyed our 50th reunion so much they didn't want to miss the 60th, but they did! Leavitt writes, "We will be sure to make plans to go to our 70th. Will drive up. We don't care too much about flying." Lately we have been hearing about a new type of cargo ship—the containership—and such ships will require special dock facilities. The Boston firm of engineers—Fay Spofford & Thorndike, of which **Carroll Farwell** is a more-or-less retired director—made a study and prepared the plans for a face-lifting of the Boston Harbor Terminal on Castle Island, which included a containership facility. The F. S. & T. Christmas greeting contained an excellent aerial photo of that Castle Island Terminal. A few address changes—or zip numbers—have been received: Mrs. **R. S. Feathers-ton** is at 8912 Stewart Lane, Stockton, Calif. 95202; **E. Kent Lawrence**, 13 Woodlawn Ave., Baltimore, Md. 21228; **Joe Santry's** N.Y.C. address is now 28 East 63rd St., N.Y., N.Y. 10021. Have you made any changes lately? Marion and I would be glad to hear from you.—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

'07

Report on our 60th Class Reunion. I have had no recent replies to the 90 questionnaires which I sent out in early December of 1966 so conclude that those interested have already answered. There were 46 completed returns received and two undelivered envelopes returned. Eighteen "expect" to come, 25 cannot come, and three are to reply later. Thirteen have voted for Plan III which gives us three days together on the M.I.T. campus. You can arrive Friday night or

Saturday, June 9 or 10. Class banquet and class meeting on Saturday evening. Sunday for rest or recreation. Monday, June 12, Alumni Day, with luncheon at noon and banquet with entertainment in the evening. Accommodations will be assigned to us on campus either in Baker House or McCormick Hall. A letter with all details, including necessary expenses, will be mailed to you in early April. There were six men who voted for Plan IV, Alumni Day only, on which to hold the Reunion. . . . As a result of my request for financial help, I have received a total to date of \$250 for which I am most grateful. . . . **Erskine P. Noyes**, I, was fatally injured in the late afternoon of Tuesday, January 17, as he was crossing busy Route 1 near his home at Falmouth Foreside, Maine. A mutual friend from Augusta, where "Tucky" lived for many years sent me an obituary notice from the *Kennebec Journal*. **Tom Gould** also sent me a notice, and a letter from Tucky's daughter, Mrs. Nancy P. Olds, of Woburn, Mass., gave me additional information. I wrote at once to Mrs. Noyes expressing the sympathy of the class and received a very understanding letter in return from her. We all knew him as "Tucky"; but in the obituary notices he was referred to as "Sandy." "Tucky" was born in Newton, April 4, 1885, and attended the Newton schools before entering M.I.T. Tom Gould and several other '07 men have kept up the close relationship that existed in their prep school and college years. While at Tech he was active in track and in 1903 won the BAA high hurdles. He worked summers for the Maine Highway Commission as a civil engineer before joining the Central Maine Power Company in 1916. He served this utility as their first safety and personnel director and was a pioneer at lecturing on first aid at the layman's level. "Tucky" toured the state, giving safety lectures to more than 10,000 persons before retiring in 1955. He moved to the Portland area in 1957 and became interested in heraldry, producing framed coats-of-arms in color for several years. He was also interested in music and played the drums with Romano's Band and the Westbrook Community Band. "Tucky" served as treasurer of the Maine State Safety Conference from 1939 to 1955, was clerk of the Old Timers' Club of the Central Maine Power Company for more than 25 years, and was a member of the Maine Association of Engineers. Services were held at 2 P.M. Friday, January 20, 1967, at the Jones and Rich Funeral Home in Portland. Burial was in Mount Auburn Cemetery, Cambridge, Mass. Besides his widow, he is survived by two daughters, Mrs. Nancy P. Olds of Woburn, Mass., and Mrs. Robert Petersen, of Falmouth, six grandchildren, and one great-grandchild.

Another such notice gave the date of death of **Sumner S. Peck** as July 3, 1965. He was carried in our files as a "non associate" member. . . . A form notice from the Alumni Register gave the date of decease of **Thomas W. Roby**, I, who lived at 834 Westover Avenue, Norfolk, Va., as occurring during the summer of 1964.

For many years he was a valuation engineer and chief of research and planning with the Seaboard-Air Line R. R. Company in Norfolk, Va. . . . The following changes of address should be noted on your class list of "Living Members": **Alfred G. Lang**, III, 850 Webster Street, Palo Alto, Calif. 94301; **Benjamin F. Carter**, VI, 2822 East Cholla Street, Phoenix, Ariz. 85028; **Harold A. Kingsbury**, X, Foulk Manor Retirement Home, 407 Foulk Road, Wilmington, Del. 19803 —**Philip B. Walker**, Secretary and Treasurer, 18 Summit Street, Whitinsville, Mass.; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass.

'08

The second dinner meeting of the 1966-67 season will be held at the M.I.T. Faculty Club, Cambridge, Mass., on April 12 at 6:00 P.M. Our 59th Anniversary Reunion will be held at Melrose Inn, Harwichport, Mass., June 9, 10 and 11. Ladies are invited to both of these events. Hope you can make it. How about some news? A post card will do.—**H. L. Carter**, Secretary, 14 Roslyn Road, Waban, Mass. 02168; **Joseph W. Wattles**, Treasurer, 26 Bullard Road, Weston, Mass. 02193

'11

The Senior Portfolio, of which I still have my copy, contains 297 pictures of members of the class of 1911. There were a few who got their pictures in the book but failed to graduate with us; and there were some who did graduate but failed to get their pictures in the portfolio. Of the select 297, to the best of my knowledge 103 are still alive. The Alumni Office has furnished me with a card index of all members of the class with whom they had contact. Of these 157 are believed to be still alive, among whom are 54 who did not get their degrees. As nobody wrote to Obie during the past month (January 15 to February 15), I have put in the above information in order to have something in this month's notes. . . . The Alumni Office sent me one change of address: **M. Hubert Judd**, P. O. Box 664, Dalton, Ga. 30720.—**Oberlin S. Clark**, Secretary, 50 Leonard Rd., North Weymouth, Mass. 02191

'12

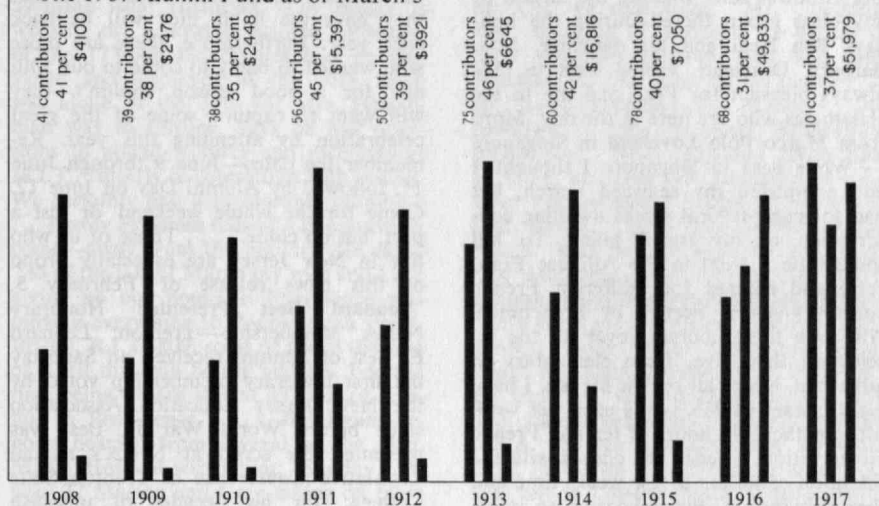
Edward B. Coy passed away in Westerly, R.I., on September 1, 1966. A nice letter from his sisters Sally and Louise of 43 Elm Street, Westerly, gave me this information and enclosed an obituary from the local paper. On leaving M.I.T. Ed went into the real estate business in his family's office. This business was founded by his father in 1902 and has been operated continuously for 64 years, the last 37 by Ed. In addition to his real estate

business he was active in the local cemetery association and church affairs. Knowing his interest in the M.I.T. Alumni Fund, his sisters enclosed a check to be credited to the 1912 contributions. . . . **Johnny Noyes** writes that he has been staying near home for a change and hasn't much news. He hears frequently from Majorie and **Cy Springall** who are wintering this year at Scottsdale, Ariz.—address 325 W. 4th Street, 95251. He also advises **Willis Salisbury** has sold his house and moved into 52 Groveland Terrace, Apt. 306, Minneapolis, Minn. . . . **Alexander W. Yereance**, '11, writes from 6518 Valley Court, Falls Church, Va. 22042, that he just heard of the death of **Malcolm Priest**, which I covered in last month's issue. Alec is well and busy. . . . A note from **Jay Pratt** gives their Mexican itinerary for this winter which includes Acapulco, Cuernavaca, Taxco, Mexico City, Oaxaca, Michioacan and Tampico. They are both planning to be with us in June. . . . You should be hearing from **Albion Davis** regarding the plans for our 55th Reunion which will be held over the weekend of June 12.—**Frederick J. Shepard, Jr.**, Secretary, 31 Chestnut Street, Boston, Mass. 02108; **John Noyes**, Assistant Secretary, 3326 Shorecrest Drive, Dallas, Texas 10145

'14

Current interest in the "goings on" in China evidently inspired the Alumni office to question the status of the Alumni from that country. As a result we have just received status reports—slips of paper with the names of six Chinese who were students with us in 1914. Each contains the notation "presumed deceased," and no address. They are: **Shao C. Chen**, **Yu M. Chu**, **Ying T. Sze**, **Captain Frank T. Yeh**, **Moo C. Hou**, **Yuan T. Ying**. We knew them, particularly Yu Mai Chu who was in Course VI. As we recall, they were all here on Boxer Fund scholarships. The Boxers were a militant Chinese group who resented the efforts of foreigners to force trading and otherwise civilize (?) them. They revolted sometime about the turn of the century, with the result that many of the Europeans were killed. Accordingly, the Europeans forced a punishment on the Chinese which called for payment of indemnities over a period of years. Later in a spirit of contrition the Europeans agreed that the Chinese payments might be used to educate Chinese students in this country—not necessarily, of course, at M.I.T. One might hope that such technical progress as has taken place in China in the past 50 odd years has resulted at least in small part from these Boxer Fund students. We wonder whether all of these 1914 students are really "deceased." . . . Alumni office sheets give the names of **Jorge I. Moreno**, Course II, once from Quinto, Ecuador, and **Carleton Sawyer**, Course X, once from New York, N. Y., in this "presumed deceased" category. We have no further information about Carleton Sawyer, but our file indicates that for a number of years following

The 1967 Alumni Fund as of March 3



graduation **Jorge Moreno** did engineering work for the government of Ecuador. . . . We have before us a clipping from the New York Times November, 1966: "Stratford, Conn., November 9—**Theodore H. Krueger**, an inventor of various sealing wax dispensers, died last Thursday of a heart attack in Yale New Haven Hospital. He was 77 years old. Mr. Krueger was the president of Better Packages, Inc., and Seal, Inc., both of Shelton, Conn. He was born in Ponca, Neb., and attended the Massachusetts Institute of Technology. He was a former chairman of the local planning board and president of the Stratford Board of Education. He is survived by his widow, Mrs. Cecilie Moore Krueger; a son, Theodore, Jr., of Woodbridge, Conn.; three brothers, Karl, Alfred and Max, and a sister Mrs. Cedric Dayton." . . . An interesting recent article in *Engineering Opportunities*, entitled "The Only Way to Fly" by Lois C. Philmus, which deals with the history of aviation, contains the following: "The young M.I.T. graduate who worked for Glenn Martin, **Donald Douglas**, as head of his own company ushered in the age of air transportation officially on August 2, 1932. That was the day TWA executives went shopping for a new transport plane. The Douglas Company won the competition with its prototype DC1 and production DC2, an all metal, stressed-skin, twin-engine transport with retractable landing gear carrying 12 passengers, cruising at 145 mph. It carried radio instruments for night flying. It was gigantic—the fuselage was 60 feet long, and expensive, \$65,000." The same article brings out the fact that there was also a DC5 in the long line of DC transports, not generally well-known since only a few DC5's were manufactured. . . . We have made, in the past, some rather critical remarks reflecting on the atmospheric and other environmental characteristics of the city of New York, so we hasten to make public firsthand information from our classmate **Thorn Dickenson**: "The answer to your question is that I am very fond of New York and have as good a time in the winter in the big city as I have in the summer in the woods and

mountains. For example, a very cheerful get together for dinner this evening at the Harvard Club between **Beacon Hill** and M.I.T.—fine food and drink." . . . We have a beautifully engraved invitation to participate in the Founders' Day observance of the Marion Koogler McNay Art Institute of San Antonio, Texas. A major feature of this affair is the exhibit of some 40 paintings by **Alden Waitt**. Several of these were pictured in the brochure which accompanied the invitation. Alden's work is not pop art by any means, conventional perhaps, and with a fidelity that one might expect of a painter with a technical background. We should have an opportunity to have a firsthand look at these at our 55th Reunion, if not before.—**Herman A. Affel**, Secretary, Rome, Maine. Mail: RFD 2, Oakland, Maine 04963

'15

Around the first of the year **Al Sampson** sent me a cartoon clipped from a national magazine, showing the typical board meeting sitting around the traditional long table. Standing in the doorway is a dejected looking character, hat on, corners of his mouth down and handcuffed to an important looking guy who is reading from a paper he holds. The caption is "—leaving a balance of zero for the fiscal year." The innuendo, the implication is obvious, so before Al and other maligning accusers like **Ben Neal** and **Jim Tobey** could pull a Price-Waterhouse on the class accounting, Fran and I took off on a five-week cruise to Buenos Aires. But, so you classmates won't miss a month's column, your dutiful and dedicated Secretary prepared these notes before sailing. On the date they are due, February 15, we'll be cruising off the coast of Argentina. Ah me! Remember those big dates, April 21 for our Annual New York City class dinner at the Chemists' Club and May 12 for the Boston class dinner at the M.I.T. Faculty Club, Cambridge. At the January luncheon of the downtown M.I.T. Club in Boston there were six of us in attendance—

Clive, myself, Archie, Wally, The Pirate and Admiral Bill—making the largest of any class group there. During the holidays Ben Neal and his daughter, Mrs. Barbara Dearman, visited with us. It's always pleasant for Fran and me to see classmates who are here in the city. More from Marco Polo **Loveland** in Singapore—"While here in Singapore I thought I had completed my seaweed search, but had to spend several weeks awaiting confirmation of my travel plans. To kill some time I went to the Alliance Française and entered four different French courses given in French by Frenchmen. Although these courses cover all the instruction they give, from elementary to advanced, it was all review for me. I have eight classes of 1½ hours each per week plus another 1½ hours of tea and French conversation. I began the classes with the intention of killing a few weeks time and then moving on. But I became so interested that I applied for and received a visa extension, enabling me to complete the semester to cover all the French grammar from start to finish. Then I had expected to go to Indonesia, Borneo, the west coast of India, Ethiopia, Egypt, up the Nile to Lake Victoria, across to Nairobi and on to Mombasa on the coast, and on to Europe. But I received an offer from the University of Hawaii to go to the Southern Philippines for a year to coordinate the research being done there on the seaweed my company is interested in. It would mean headquarters at Zamboanga at the southeastern tip of Mindanao. Although this would be a tough place to spend a year, I may accept. Despite what I have been through, my digestion is all right, but unfortunately I have contracted arthritis in my back which is uncomfortable. I have to force myself to walk six miles every day." I can only repeat what I've said before—what a guy and how does he do it. Everyone with families and guests is invited to the class cocktail party Monday afternoon, June 12, at the M.I.T. Faculty Club, Cambridge. Al and Barbara are setting up a new and attractive program which will be very appealing. Better be there. . . . Have you paid your class dues to 'Help Azel.'—**Azel W. Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

'16

Looking forward to our 51st Reunion in June, we have a warm opening message from our ever-doing president **Ralph Fletcher**: "In about two months many of us will again be together on one of our famed weekends. This year we return to the Chatham Bars Inn in Chatham, Mass., (Cape Cod) where we have enjoyed most of our interim reunions. Generally, one would expect that after the tremendous turnout we had at our 50th very few would be on hand for our 51st. However, we have the feeling that we will have a substantial group present. There are many of us who have been attending every year and wouldn't miss for any reason. Then, there are those who

made it back for the first time in many years at the 50th Reunion, and now that they have the habit they will be back each year. Furthermore, there are those who wanted so badly to come to our 50th and for a good reason couldn't—they will want to capture some of the great celebration by attending this year. Remember the dates—June 9 through June 11, followed by Alumni Day on June 12. Come for the whole weekend or just a part, but do come." . . . Those of us who live in New Jersey are especially proud of this news release of February 5. "**Leonard Best** Presented Honorary NJEA Membership—Trenton: Leonard E. Best of Summit received on Saturday the first honorary membership voted by the New Jersey Education Association since before World War II. Best was presented the scroll at NJEA's annual Legislative Conference at Trenton State College, 'for his decades of unselfish service to the improvement of education in New Jersey.' A former Summit school board member, Best was chairman of the Citizens Committee for College Opportunities, which successfully campaigned for adoption of the 1959 \$66 million bond issue to expand New Jersey's public colleges. He has also been chairman of such state committees as the N. J. Educational Planning Commission, the State School Aid Commission, the N. J. Citizens Committee for the Public Schools, and the N. J. Committee for School Support." This is something richly deserved, as we New Jerseyans all know so well his long and distinguished leadership in good education. He has had awards and awards—we can count at least six of them since 1953, and he never even told us that one of these was an honorary doctor's degree! This was awarded him in 1960 by Paterson State College in recognition of his outstanding service to education. Multiple congratulations, Len! . . . And how about this! In November, at the annual convention of the National Audubon Society held in Sacramento, **Walt Binger** was elected chairman of the Executive Committee. The Society has about 45,000 members. Walt says: "While it consists largely of people who consider themselves lovers of

Leonard E. Best, '16, (left) receives an honorary membership in the New Jersey Education Association "for his decades of unselfish service to the improvement of education in New Jersey." Lewis Appelgate, NJEA's director of public relations, presents the award, with Mrs. Best looking on.



birds, it has been increasingly influential in all phases of conservation, its membership obviously being oriented to that purpose. If it had been my knowledge of birds, which I might say is practically non-existent, I should never have been retained on the board for the time permitted by the by-laws nor elected to this current position. They seem to think I know something about conservation, and I think it is no secret to say that the ambition of Audubon is to become the paramount conservation group in the country."

We regret to report the death of our beloved Class Agent, **Bill Barrett**, in the Stamford, Conn., Hospital on January 21. Since retirement as vice-president of the Metropolitan Life Insurance Company, he had for four years been president of the American Craftsmen's Council, a national organization sponsoring handiwork and crafts. We have many clippings and articles about Bill, but we think that his life and work and essence are best summarized by classmate **Steve Brophy** as he spoke to his fellow trustees of the Craftsmen's Council: "In mourning the death of our president, William J. Barrett, the trustees of the American Craftsmen's Council wish to record their sense of loss at his going and their deep gratitude for the devotion and single-minded leadership he gave to the cause of craftsmanship, first as trustee of the Council for 21 years, and finally as Council president for almost four years. William Barrett was born in Boston, graduated in 1916 from M. I. T., of which he was a most loyal alumnus, received a master's degree from the Wharton School of Finance and Commerce of the University of Pennsylvania, joined the Metropolitan Life Insurance Company in 1923 and rose through the ranks to a vice-presidency in 1960. During World War II he served his country on the Industrial Advisory Board of the National Recovery Administration, helped organize the War Resources Board, and in 1940 served on the Advisory Committee to the Council for National Defense. Old Sturbridge Village was one of his abiding interests, and much of its success and popularity today is due in large measure to his patient and persistent efforts. A long-term trustee of the American Heritage Foundation, he worked with great zeal for a greater understanding and appreciation of the value of the freedom we enjoy as Americans. Though primarily an engineer, Bill Barrett was deeply interested in all forms of human endeavor. From his young boyhood on he believed in the importance of craftsmanship in life and its value to the spiritual welfare of the individual. When in 1963 he retired from business, it was typical of the man that he did not retire from life but plunged at once into his long-felt interest in the American Craftsmen's Council, assuming its presidency on the death of David Campbell in the fall of that year. His devotion to the Council was an inspiration to all who were associated with him in his efforts. He thought of it as a cause worth working for. He brought to the Council the results and experience of his career and

gave it organization and leadership. . . . He was a modest, self-made man; a warm friend and able associate. He worked devotedly in the service of others with patience, kindness and clear vision. It is this man we loved and remember, and we wish this to be recorded in our minutes, thus communicating our deep appreciation of all William Barrett stood for to his family and to his many friends." Bill was a warm and ardent attendee of annual class reunions, and with his wife Margaret added graciousness to these events. We surely will miss him.

We still haven't quite gotten over the 50th Reunion and continue to get reminders of what a special time it was. **Ray Brown** writes from Lewiston, N.Y.: "When your letter came, Melva and I were packing my red sport coat. We are spending Christmas in Cleveland with son Roger. Earlier my grandson Jeffrey, on seeing the class picture, asked me to be sure to wear the red blazer at dinner Christmas. I think this is the start of a custom in our family. When we were packing the coat, I had a sudden flood of reunion memories—so happy, so many, so stimulating, so moving—and so grateful to all those classmates not only for the wonderful reunion but for the association over the past 50 years!" And **Steve Brophy** reports this letter from Ted Mangelsdorf, President of the Alumni Association: "I was indeed interested in the report of the 50th Reunion of your class. I think it was a fine job of reporting, and your class can be mighty proud of what you had to report." And Henry Strout, '17, who is working on plans for the Chatham Bars end of 1917's 50th tells Steve: "Thanks very much for your notes on the 50th. What a tremendous job you did! Can't see that anything could possibly have been overlooked." And we, that is **Peb Stone** and your Secretary with a big assist from Mary and **Joe Barker**, acknowledge willing help from a number of '16ers in our work of identifying everyone in the Osterville and Cambridge reunion pictures—help from the **Jeff Gfroerers**, the **Earle Pearsons**, the **Al Pettees**, the **Joel Connollys**, the **Henry Shepards**, as well as above average help from Bob O'Brien, our honorary class member. The goal: a complete list to post on the bulletin board at the 51st reunion in June. As we write (February 11), we understand the Stones will soon be on one of their Caribbean scuba-diving travels with a week each at Barbados, St. Lucia, and Young Island which is only "about a 100-yard swim from St. Vincent." Anyone is free to ask Peb and Dolly if they swam that 100 yards. . . . This month we seem to have heard a little from a lot of folks which surely helps the variety. **Frank Ross** writes from his winter homeland in Florida of "no particular changes since I last wrote you." Then: "Down in Naples, Fla., for the winter doing the usual lazy things of Florida living. Back to Hartford in May." . . . **Earle Pearson**, writing about locations in the Osterville picture, says: "Me—I'm in the 3rd row, back of Edith, 4th from the left, looking a bit like a member of the 'clergy' due to position behind the man on my left." . . .

Dick Hunneman of Woburn is anxiously awaiting what Historian Walt Binger is working on, a possible printed collection of the 173-odd biographies that he collected and displayed at the 50th. Dick was alone at the 50th for Mrs. Hunneman was in Europe. Says he has occasions to attend lectures and meetings at M.I.T., "mostly in connection with sailing. We certainly had a memorable reunion." . . . **Hovey Freeman** tells of a big move to come—away from the big city. He says: "As of the last of March my wife and I are giving up our house in Providence and moving everything to Poppasquash Point, Bristol, R.I. 02809, so as of about the first of April that will be my address. For the time being we are still at 45 Hazard Avenue in Providence." . . . **Jim Evans** reports hearing from several of the clan. **Maury Holland** writes him: "Sunday January 22 Marion and I are taking off from Boston via Miami for 'Grand Cayman' BWI, she to suntan on doctor's orders and I to learn the technique of bonefishing which Hoover once told me is the greatest." . . . And **Duke Wellington** told Jim he would not be able to act as proxy for the P.O. Department for Jim for he was not going to Florida. . . . **John Fairfield** includes the following in a note from Troy, N.Y.: "No news here. You remember that Thoreau said he was the official inspector of sunrises and sunsets, today a lovely red sunrise; it is easy to see them these days, less easy in June when 4:30 is the time. Four cock pheasants eating outside our breakfast window this morning, only two hens; usually the ratio is the other way." . . . And January 31 brought Jim a letter from **Dave Patten** with distressing news: "We elected to drive to Washington for the year end, and after New Year's and some marrow-freezing duck shooting off the Eastern Shore, headed for Florida. In returning via St. Petersburg, where I have a sister-in-law, we were badly smashed up. The car lost most of its beautiful face, and we escaped luckily with broken bones, bruises, and assorted minor cuts. These are mending but it seemed advisable to return to our own doctors in Boston for final check-up. Fortunately the defendant was judged at fault, so they must make amends. Of course injuries of this sort can come back to plague one later. Will be obliged to fly back to St. Petersburg for the car in about two weeks."

Gyps and **Cy Guething** went off to their favorite winter haunt on Harbour Island, Bahamas, about the first of the year. Cy gave us a bit of fun when he wrote in early December: "Now here it is! For some time I have been slowly losing my mind, and it has been so gradual that I don't even miss it. It all started by not remembering names, then faces and now almost everything. I put things away in very obvious places, but when I go to get them the obvious places do not produce. A gremlin has removed them. And that is just what happened to the class picture. I took it over to **Spence Hopkins'** house to show him, brought it back and misplaced it. But it will show up." We asked Cy whether mail would reach him in the Atlantic if we addressed it merely "Cy, Harbour Island," and he practically

agreed except it might be surer if instead of "Cy" we substituted "Mr. Guething, Sir." Speaking of overseas, we expect to hear any minute from Nell and **Don Webster**, for they took off on January 20 on the *Constitution* for Mallorca, and promised to send us some "Mallorquin philosophy." Now switching from East to West, we have **Lev Lawrason** writing from his retirement village of 10,000 at Seal Beach, Calif., located near Long Beach. Says he can visit his two married daughters—one lives in San Diego County and the other in West Los Angeles. "This gives me a chance to work in the garden, build stone walls and other things that keep a home worth living in." He finds it a very pleasant place to live with likable neighbors from all over the U.S.A. "If we can keep the airplanes from falling on us, we can get along o.k. One fell in Laguna Beach Leisure World lately and did considerable damage besides killing five people. A month ago a jet Navy plane fell about a mile from my apartment building, but fortunately no one was hurt." . . . **Brad Curtis** sends information from Interlaken, N.J., lined up with our four-item questionnaire. 1. Doing: he has retired and has had to give up sailing since he had his "ticker trouble." But he is working in wood, new and drift, and "right now I am on stools. What do I do with them? Why, I just give them away to anyone who wants one. The work exercises my arms and has improved my general condition." 2. Where been: mostly at home but visited their daughter in the new Bell Labs location, Napierville, Ill. 3., 4. Children, grandchildren doing: grandson in University of Delaware; granddaughter, a major in art, married and working with American Card Company in Cleveland. 5. Philosophy: says "somewhat out of my line," but recommends keeping active physically, keeping in touch with other people, and leaving the rocking chair alone. . . . **Paul Page Austin** is enjoying very much his work with Arthur G. McKee, Non-Ferrous Metals and Materials Division, in San Francisco. Says: "For the last year I have been working on the design of a big lead smelting plant in southern Missouri. I write specifications and make the bid comparisons on such large items as a baghouse (for removing dust from the air), a sintering machine from Germany, a sulfuric acid plant, centrifugal fans, and numerous other pieces of equipment." He is hoping to have a trip to the site during construction or at start-up and if so will have a story for us. . . . While in Albuquerque in mid-January we talked on the telephone with Virginia and **Joel Connolly** in Tucson, and with Kay and **Irv McDaniel** in Newport Beach—quite inexpensive after 8:00 P.M. Joel and Virginia were just going to attend, with Ann and **Will Wyld**, a slide show and lunch of the Evergreen Club of the First Congregational Church of Tucson. The Wylde, of Stamford, Vt., are at Tucson Green Valley for the winter. Irv and Kay continue highly pleased with their Newport Beach location and were beginning to decide how many bags and suitcases they should take on their spring trip to the far Pacific. . . . **Emory**

Kemp reports from Sarasota a ladies night with the M.I.T. Alumni Club of Southwest Florida—over 20 there with their wives. Among those present near our class, he says, were: "Vincent Panettiere, '17, and his wife, Joe W. Wattles, '08, and his wife (he is the Class Secretary), and Hardy M. Cook, '09, and Robert E. Robillard, '20—a wonderful time was had by all." And perhaps, in the words of Horatio Alger, "they did ample justice to the bountiful repast set before them." Referring back to his old homeland of Cape Cod, Emory tells of his granddaughter Linda's marriage: "the day before Christmas in the Methodist Church in Wellfleet with reception in Provincetown 16 miles away. The husband's grandfather started the special sandal shop years ago (very expensive hand-made, all-leather sandals), and he is going to operate it there in Provincetown. He has bought his father's house in Truro (next town), a beautiful home, all remodelled, over 200 years old, and they both are very happy." Emory and Ruth will be back in May and June! . . . Also from Florida, but from Inverness, comes word from **Coke Flannagan**, also formerly of Mountain Lakes and of Bell Labs, whose stories on the front deck of New York's Christopher Street ferry-boat (long extinct) we still miss like everything. Just for instance, stories like the one about the "smart pills." Coke says: "I really have nothing to offer in the way of news. We have 12 acres here that need attention, and I find plenty to do trying to make the place look like something—but that is purely routine and only of interest to the caretaker. As for me personally I might quote some unknown character: 'I can live with my arthritis, my dentures they fit fine; I can see through my bi-focals, but I sure do miss my mind.' . . . Here's a treat for you this June—a picture of a '16 pair in a live fully-functioning top-down 1913 Chalmers phaeton, with a neat tool box on the running board, at a curb in the Boston area just waiting for you to say old-fashioned things! It is foolish to ask who is it, for it is obviously and of course Henry and Frances Shepard. We'll have the picture, taken at Christmas 1966 and furnished by Steve Brophy, at the 51st Reunion. Along with the picture, Henry is saying to Steve: "Curling is lots of fun, and I recommend it to you when you get to the time when you find it necessary to slow down." . . . If you want to see something truly remarkable in a case history, ask Steve Brophy (470 Park Ave., N.Y.C. 10022) to send you a copy of the 1966 Annual Report of the Institute of Reconstructive Plastic Surgery. This describes the rehabilitation work being done in helping children and adults who are suffering from facial disfigurement and hand disabilities which require correction by reconstructive plastic surgery. The Institute is directly supported by the Society for the Rehabilitation of the Facially Disfigured, Inc. of which Steve Brophy continues as chairman of the board. . . .

We reported the passing of **Val Gooding** in our March column but did not have history details. Now we have clip-

pings from the December 23 *News* and the December 24 *Union* of Springfield, Mass., noting in part: "Percival P. Gooding, for whom the Gooding Reference Library at Strathmore Paper Company was named, died Thursday in Clearwater, Fla., where he had moved after leaving Longmeadow. Born in Lynn, he moved to Clearwater two and a half years ago. Mr. Gooding was appointed technical director of Strathmore Paper Company in 1937, a position he held until 1961 when he retired. For four months after his retirement he remained active in the company as a consultant. After being graduated from M.I.T., he spent a year as assistant in the M.I.T. theoretical chemistry laboratory, then joined Eastern Manufacturing Company as chemist. World War I interrupted Mr. Gooding's career with Eastern. He joined the Chemical Warfare Service, doing research on gases and signalling devices at American University in Washington, D.C. After the war he returned to Eastern and in 1922 became chemist for Strathmore. Mr. Gooding was a member of the American Chemical Society, Technical Association of the Pulp and Paper Industry and a charter member and a founder of the Western Massachusetts Section of the American Society for Quality Control. He was a past master of Huntington Lodge of Masons, a member of the Melha Shrine Temple, and of Trinity Presbyterian Church, Clearwater. **Stew Rowlett** adds: "Val was really a grand friend—I miss him." . . . Now we approach the end of the page. Interesting letters from **George Hale**, **Allen Pettee**, and **Vertrees Young** will be reported in the next issue. We appreciate the willing response to our letter requests for news and philosophy, and continue to urge that you write a little but write often to any one of your class officers. And hold open those dates—June 9-11 at Chatham Bars Inn, Chatham, way out on Cape Cod, and June 12, Alumni Day, in Cambridge. We look forward to joining the class of 1917 celebrating its 50th at the same time in Chatham Bars!—**Harold F. Dodge**, Secretary, 96 Briarcliff Road, Mountain Lakes, N. J. 07047

'17 50th CLASS REUNION June 9, 10, 11, and 12

As these notes are being typed, the blizzard of '67 is a thing of the past, and now everything should be focused on the 50th Reunion! All those attending will have accommodations at McCormick Hall Thursday, Sunday and Monday nights at the Institute. Breakfast for these days will be served at McCormick Hall. Friday afternoon we all go to Chatham Bars on Cape Cod, staying there until Sunday afternoon when we return to Cambridge. Transportation to and from Cambridge will be available for those who do not have their cars and especially for all widows. Schedule of events has been covered by news letters to the entire class, and reservations should all be in by now. However, last minute reservations will be arranged for somehow, both for Chatham Bars and the men's blazers. Orders

for blazers received after the deadline can be honored although delivery may be the following year, as I am informed that class of '16 still has 25 or more to deliver. . . . **Brick Dunham** is editing and publishing the 50th Reunion brochure which presumably will be mailed and in your hands by now. The class of '17 mailing list consists of 356 names. What has become of our two co-eds? And to date your Secretary has not had any notes from the widows, but we hope to see these fair ladies at the Reunion. . . . **Loosh Hill**, our honorable Treasurer who advises he is now working five days a week, should have all deposits properly recorded here now. As of January 12 he writes, "We will need a lot more money between now and summer for our 50th. At this moment I would not worry too much about any bear market, but someday in the not-too-distant future we are going to have to pay the piper." So let's celebrate in a big way our 50th!

Dick Lyons of Houston, Texas, reports he is having meager results in collecting news of '17ers in his part of the country, including Mexico. We hope this will be corrected on or before the 50th. Contact or write Dick at 1602 First City National Bank Building, 77002. . . . We have **Bill Hunter**, who with Doris is spending the winter and spring in and about Pasadena, Calif., to thank for his letter of January 4. "I was talking to **Ralph Ross** on the phone the other evening so took the opportunity of finding out all the different things he is doing to keep himself busy. And there is quite a catalog of them. As you know, some years ago Ralph retired from AT&T and established himself on a 65-acre farm in Danville, Vt., which is only a few miles from St. Johnsbury where he was brought up. He has certainly put down his roots in that area as witness of the various jobs he is holding at the present time. First, he is president of the Brightbrook Hospital in St. Johnsbury, as well as president of the Northeast Vermont Regional Hospital, which is a new organization and will eventually take over their Brightbrook Hospital and perhaps other hospitals in the area. Their present job is to raise money for this venture. Ralph is also president of the Vermont-New Hampshire Blue Cross, a member of the Governor's Advisory Board of Health Programs. This is a regional board and eventually will include territories in Northeastern New York and Northern New Hampshire and will concern itself with what is called the Dr. De Bakey program. This covers Ralph's activities in hospital and health affairs, but in addition he is vice-president and chairman of the Executive Committee of St. Johnsbury Academy, which has an enrollment of 710 students and provides the local high school for St. Johnsbury as well as being a boarding school. He is also one of three members of the Vermont State Highway Board which is responsible for the operation of the Vermont Highway Department. He is also a director of the Citizens Savings Bank and Trust Company of St. Johnsbury where he started when he was in high school as an office boy. Finally, he is chairman of the Business Committee of the North Congregational

Church. This all surely keeps him busy, but in spite of it he and Dorothy always seem to have time to entertain Doris and me royally whenever we are in the vicinity."

Mrs. Allison (Bill) Williams writes further relative to Bill's passing on August 10, 1966, and while we have already mentioned this in past notes, I feel you may be interested in the following. "Vicksburg, Miss., *Sunday-Post* August 28—a native of Yazoo County, he was the son of the late Senator and Mrs. John Sharp Williams. He had lived in Vicksburg since retiring after a long career in engineering and in military service in both World Wars. Colonel Williams attended the University of the South at Sewanee where he was a member of the Phi Delta Theta fraternity. He later received his B.S. degree in science in 1917 from the Massachusetts Institute of Technology where he majored in electrical engineering. He was made a Fellow, the first in the state of Mississippi, in the American Institute of Electrical Engineers in 1935. He received an additional degree in professional engineering at New York University in 1939. He was a captain in World War I and a colonel in the Engineering Corps in World War II. He was a member of the First Presbyterian Church and a 32nd Degree Mason, member of the Pearce B. Tutt Lodge #17 at Benton. Colonel Williams is survived by his wife Henriette of Vicksburg; two daughters, Mrs. Nat Bullard of Vicksburg and Mrs. U. Grey Flowers, Jr., of Jackson; six grandsons and seven granddaughters." Mrs. Williams supplements the above, "Several years ago Allison showed me around Boston walking through some of the cherished landmarks. It had been a long time since he had returned, and like you, Dix, he was very pleased to find that 172 Huntington Avenue was still there. In his second year at M.I.T. illness ending in an operation caused him to lose a year. However, he did take some lectures at Harvard, and the following summer and year he worked for Stone & Webster. Allison and I had planned to attend the 50th Reunion. I did not know that widows were invited. I think it is a good idea, but I do not know now that I will participate. During his active years he was head of an engineering consulting firm, general manager of Mississippi Utilities Corporation, chief of Division of Rate Costs and Valuation of the Federal Power Commission, and assigned during World War II in the Corps of Engineers in charge of war utilities and construction. As a hobby he was an inventor, having some 30 patents here, Canada and abroad. Four more are even now being processed by his patent attorney in Washington, D.C. The later patents are all related to brake control systems, about which he was wont to comment "... is like having a bear by the tail and not being able to let it go." I always enjoy the *Technology Review*, not only for the news concerning the class of '17, but also the interesting articles."

Jim Flaherty advises he was at a pre-bon voyage luncheon party at the Harvard Club for the class of '15 Secretary. He further advises that it was a dry run. However the real party definitely was not,

even at 10:00 a.m. Jim writes that he is going to take lessons in digging sea clams off Point Pleasant, N.J., on or about **Bob Erb's** birthday March 17. Incidentally—all medicine is not necessarily brown! ... Obituaries continue to come in relative to **Robert Gordon Shand**—morning *Globe* and *Herald* of Boston, *Enterprise* and *Times*, Brockton, and *Evening-Eagle-Tribune*, Lawrence. ... The Institute is assuming as deceased the following: Philip J. Cianciolo, Michael J. Dumit, Harry Frank, Harold A. Haven, Te P. Hou; Professor Shou-Heng Huang; Yung C. Li; Pang C. Loo; Frank S. Rizzo; Hin Y. Tu; Frank A. Wilmot; Tai M. Wu; Chi F. Yeh and Fuchun Yen. ... Changes of address: Harold M. Brayton, 65 Hillside Road, Chester, N.J. 07930; Enos Curtin, 200 East 66th St., New York, N.Y. 10021; A. R. Morton, Union, Maine 04862; Iu-Shing Wan, 232-A Prince Edwards Road, Kowloon, Hong Kong. ... Referring to the Beaver Tales, Volume 1, Number 24, January 25, has this note thereon, "How about giving the Gift a plug in the next class notes." For clarification the Alumni Fund year is the same as the academic, ending June 30.

The February New York monthly luncheon brought together **Bob Erb**, **Dick Loengard** and **Dix Proctor**, with Rudy Gruber, '16. Rudy advised that he was the only one at the '16 luncheon. Apparently '16ers do not like blizzards. Bob Erb and his wife Pat are flying to Mexico and may be in Mexico City for the M.I.T. Fiesta March 8, 9 and 10. However, Bob says he must be back for his 70th birthday party on the 17th. Believe all '17ers are now at least three score and ten. To assure our corner table at the Chemists Club maybe we should combine again with 1916 and also invite 1915. Are there any suggestions as to the best day for the usual once-a-month Thursday luncheon? Incidentally, the Chemists Club has no membership waiting list and it provides an ideal setting—we left good ole 17 Gramacy Park to get in the Grand Central vicinity, and 52 East 41st is about as Grand Central as you can get!—**C. Dix Proctor**, Secretary, P.O. Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, 1572 Massachusetts Avenue, Cambridge, Mass. 02138

'18

Emerson believed "the world is his who has the money to go over it." Certainly, lifting the horizon by going from one place to another ought also to stretch the mind of any person in search of understanding. A good letter from **Ernest A. Grunsfeld**, 157 Boulevard St.-Germain, Paris VI, begins, "I'd give almost anything to know how you located me, although I can guess. Was it through **Ken Reid's** daughter, Mrs. William Leach of Pawlet, Vermont? [No.] It was nice hearing from you and to know what you are doing. There are two volumes of *Who's Who* in my apartment which give the dry statistics of your career, but I hadn't realized how extensive it was. Your present assignment as head of a college depart-

ment of social science caught my fancy because my son-in-law is a professor of sociology at Eastern Michigan University. I'd never heard of the place till he went there, but it has 13,000 students. That gives you an idea of how higher education is expanding. When I was in the States in November and December, I attended a meeting of Course IV alumni called by Professor Anderson, who is now the dean. He wants to start a Course IV Alumni Association to advise and help the School of Architecture and Planning. It turns out that I am the dean of the group, astonished to find myself the senior citizen. I'll be 70 in August and am coming home for the occasion. All of our children—eight counting spouses, and eleven grandchildren—are invited to spend a long weekend with us in the Poconos for the event. I am busy making 19 drawings of Paris to present to each of them in a silver frame, with an inscription marking the August occasion. Going back to M.I.T. affairs, the only way I have kept up is in the awarding of an annual fellowship for European travel, started 21 years ago. Architectural students between the fourth and fifth years are eligible provided they have ability and can show that without the grant a European trip would be impossible. Now to fill in a little on myself beyond the details of *Who's Who*. After the First World War I did not continue working for the Navy but became an architectural draftsman in New York, which was then my home. In 1920 I left for Europe, passed the exams for the Ecole des Beaux Arts in Paris, then spent the next three years between Paris, the American Academy in Rome, and traveling. Some of the latter I did with Ken Reid, Leon Keach, '17, and Louis Rosenberg, '13. It was from Louis that I learned a lot about sketching. Thoroughly unhappy about quitting Europe, I returned to the U.S. and practiced architecture first in N.Y. and after 1924 in Chicago. I had a great time doing it. It absorbed my whole life, so much so that after 30 years I suddenly felt I had had enough. Beginning in 1954 I have lived a good part of the time in Paris where I have a studio and like to paint. I am now a professional, but sell just enough to qualify as such. I like to keep the paintings I've been reasonably pleased with. I'm unwilling to sell the others. I can assure you that oil painting is a life in itself and a continual challenge. On the personal side, I have two children by my first marriage (ended in '42); a daughter who is married to a musician (assistant professor of music at Northwestern) and now chief of section in the Dallas Symphony; and a son Ernest, 3d, (known as Tony) who graduated in '51 from M.I.T. and who is practicing architecture in Chicago. My daughter has two girls and a boy; my son a girl and a boy. I have two stepdaughters by my second marriage (to Maurine McCormack). One daughter has a daughter and a son. She is married to an engineer. The other has four boys, all towheaded. It is her husband who is the sociologist. My wife and I lead a very easy, delightful life. We generally spend the fall months at home visiting our scattered family. Almost all of the children have visited us several

times in France. In 1957, as a matter of fact, we rented a chateau near Aix-en-Provence and had them all with us for almost two months. It was a wonderful experience, marred only by the fact that some of the younger children had difficulties getting used to the change in diet. The rest of the year we are either in Paris or traveling. Last year we visited the Middle East at Easter time and spent part of July in Ireland. This year we are going to Morocco (had to look up how it's spelled in English—in French it's 'Maroc') in March—home for the big event in August. I hope I make it! If you ever get over this way, you know where we are, and I'd be delighted to see you."

Cornelius V. Knox, Course I, who, as far as your scribe is aware, is a technical writer for the Electric Boat Company at Groton, Conn., writes of travel in our own country. "Did you ever have a 'quiet time in the country'? Well, we did. It was a school-and-college houseparty for skiing during the Christmas holidays at our farm in West Halifax, Vt. With my son, his family and assorted friends we slept 10, with only one on the floor in front of the open fire. One evening when the skiers returned from the slopes, they had rounded up seven more dinner guests. Here we appreciated one advantage of a big house; the seniors can have cocktails in the living room while the juniors are having coke and hot dogs in the kitchen. Fringe benefits included a blown fuse at the height of dinner preparations; and it had to be then that the water pump conked out. By a miracle the plumber arrived and fixed the pump all within an hour. (miracle no. 2: only \$9.38 including parts and two trips to town.) That night a guest dog, untaught in the freedom of roads or woods, and thus quite likely to get run over, went completely AWOL. So my daughter-in-law got up at 2:00 a.m. to recover the pooch by cruising all roads in a station wagon. Would you believe 10 degrees below zero? [Yes I would. We have seen 30 below on our veranda.] You can understand how all that ski equipment jammed the checking facilities of the mud room. But did you ever know a boy who could leave behind one ski? (Whadday expect, I think he is headed for R.P.I.) Skiing anyone? Or at your age would you rather just watch?" There is also a letter from **John Poteat** who says, "I was unable to send an account of our European trip as a Christmas message because of the operation that gave me a new 'ball bearing' hip. I did get it out as a New Year's greeting. **Sax Fletcher** suggested I send a copy to you. It will take about 20 minutes to read. I haven't braved golf since I got my ball bearing hip, but it won't be long. Our course has been constantly in use, for our thermal belt has blessed us with a beautiful spell of weather this winter. We hope to drive to Florida in February to visit my brother in Ormond Beach as well as many friends who have been unfortunate enough to retire to Florida instead of in this paradise in western North Carolina. When you dig out of your snowbound domicile, why don't you try a trip in this direction? Our 50th is racing at us at great speed, and I hope to be on hand for it." I have the

four-page, single-spaced document on the European trip and promise to abstract its high lights for the May notes. John and I had some further correspondence concerning **John Robert Longley** with whom many of us had a wonderful association of such long standing that when I think about it I'm grateful to be alive.

But let "**Ned**" **Longley** (James Edward) tell the story. "This time my news is of many varieties. Last summer my twin brother John, his wife Esther, my Hjordes, and I took a clockwise auto tour of the United States. It was great fun. We went leisurely, visited many relatives and friends, saw lots of interesting things. The sojourn came to an end in Portland, Ore., where Rob was taken ill. Six weeks in one of the city's fine hospitals and three more of convalescence brought such good improvement that he and Esther were able to fly home to Washington, D.C. More weeks of apparent improvement went by until suddenly on October 26 he suffered another attack from which he died almost instantly. His going leaves a sad gap in our clan. It has been a hard blow to me. Rob was one of the few of our class who stuck closely to the profession for which his studies prepared him. A Course I civil engineer with fourth year sanitary engineering specialization, he joined Pearse, Greeley and Hansen, hydraulic and sanitary engineers of Chicago, as soon as Uncle Sam told him he was no longer needed to put Kaiser Wilhelm in his place. Rob's part in the engineering of sewage treatment works for several cities including Peoria, Ill., led to the position of manager and district engineer for the Greater Peoria Sanitary District which he held until his retirement in 1958. He was a member of national, state and local engineering societies, and the University Club and Country Club of Peoria. No doubt you noticed that I spoke of Rob and 'his wife Esther.' This will come as a surprise to his classmates as he had gained the reputation, quite rightfully, of being a confirmed bachelor. No, it couldn't last! At the age of 73 he sure enough did take unto himself a wife, and a very lovely one too, Miss Esther Henderson of Washington, D.C. He withstood a bit of kidding about having been 'a bit hasty' and 'having put up a good fight' and all that. Rob took it with a laugh which was his nature. In 1962, four years after I retired, Hjordes and I fled from the rat race of the northern New Jersey area to the mountains of western North Carolina. The move turned out to be pleasant and rewarding, with new scenery, friends and associations. Two fine daughters, each with four fine children (all exceptional, of course, just ask Grandpa!) and fine husbands, now constitute our big interest and keep us shuttling between Ohio and Georgia. Happily, over the years we have seen a good deal of Helen and **Walter Robertson**, and now in our Tar Heel location we have had some good visits with John and Betty Poteat in our Asheville home and in their lovely mountain-side home in Tryon, N.C. Over the years the world has been good to us. We have been well and happy, have managed to keep the wolf from the door, and have done a bit of traveling—a trip around the

world, several to Europe—notably Norway (the home of Hjordes's Viking ancestors and cousins) and one to South America. Well Alexander, 'nuff for now. Hjordes and I wish you and your Carolyn much happiness together." Human beings don't come any better than those Longley boys. Both possessed a disciplined grace that infused their friendship with the wonderful richness of being alive. They lived in calm joy, tenderness, and courage. It conjured up new visions in the lives they touched. Character like that is among the few things it is impossible to give to another person and not mean it. We have all been glad those twins were born and grateful for the privilege of knowing them.

Perhaps, as Emerson said, "the world is his who has the money to go over it." Only for a while, Mr. Emerson, only for a little while. Fate builds the warp. All we can be is the shuttle going through it; a shuttle faced by many hazards. The Alumni Office informs me that far more than a corporal's guard of us have died in the last few months. Definite dates are largely missing, and no details are available in any instance. **Donald Browne**, Course VIII, of New York City; **Wei-yu Chiu**, VI, Shanghai, China; **Earl Greenleaf**, I, North Calais, Vt.; **Aaron Goodman**, VI, Pittsburgh, Pa.; **Chuan Y. Hsu**, I, no address; **Yun Chung Hsu**, XIV, no address; **Robert V. Kleinschmidt**, II, who apparently turned to medicine, Stoneham, Mass., November 16; **Carlisle C. McIvor**, VI, Tokyo, Japan; **En C. Miao**, I, Shanghai, China; **Edward H. Moffatt**, VI, Brantford, Conn.; **John M. Mulowney, Jr.**, VI, Brookline, Mass.; **Frank J. O'Connor**, XV, Brooklyn, N.Y.; **John S. Salah**, II, no address; **Haigh H. Sarafian**, V, Lawrence, Mass.; **Tse-Sing Sih**, I, Shanghai; **Yu C. Tu**, I, Shanghai; **Zeng-Tse Wong**, II, Shanghai. We are not immortal. All, rich and poor alike, travel to "that undiscovered country from whose bourne no traveller returns," as Hamlet said—**F. Alexander Magoun**, Secretary, Jaffrey, N.H. 03452.

'19

A good letter arrived from **George McCarten**. He and his wife flew to Detroit on December 19 to attend the wedding of his first granddaughter. While there his daughter Peggy had the **Everett Dotens** out for dinner. They were fine and have been doing considerable traveling and are planning on a trip to Hawaii. **Rod Bent** had stopped in Lancaster for a visit. He was on the track team at Tech, started out with '19, and after Navy service graduated in 1921. Rod makes Early American chairs at Gardner, Mass., does a lot of skiing, is an ardent salmon fisherman and has a fishing lodge on the Miramichi River. George says, "Personally I have not much to report, only more of the same. I use a walker and wheel chair. Last time we were together I used a cane. However, the M.D.'s haven't shut off bourbon so life is o.k. Please give my regards to classmates you run into, and keep the sand out of your shoes." . . . **Frank Rey-**

nolds writes from Venice, Fla., "Sorry but there is no interesting news. My wife and I enjoy reasonably good health, good enough for us to spend 3½ weeks touring Mexico and Guatemala last spring. Each summer we drive to Massachusetts and New Hampshire, seeing our children and grandchildren on the way. We spent Christmas with another daughter and family in La Jolla, Calif. . . . **Lan Quick** is enjoying good health. He retired April 1, 1964, and since then has done quite a bit of traveling. In January he spent two weeks in Sarasota, Ponte Vedra and Atlanta. He has three grandchildren who live a mile away. . . . **Lloyd Sorenson** has had a busy year since retirement. He plays golf with his wife, takes care of a city home and a summer home on the York River, a 33' express cruiser and a 16' outboard motor boat. Last year he spent three months working as a consultant for Lockheed. He has eight grandchildren.

Ed Moody has a new address: 29 Hazel St. Nashua, N. H. 03060, R.F.D. #2. He is ¾ retired, but still goes to shop every day for about 15 minutes. "After two heart attacks have had to shift into second, but still do a little traveling for the business and sneak in a dance or two on some Saturday nights. Also write a verse now and then—second book on the way." . . . **Jack Stevens** sent a message dated January 13. "Here I am amid mountainous snowbanks in Bloomington, Ill., ready to take off for Arizona. Have been spending my winters since 1958 at the Country Club of Florida, Delray, and wouldn't you know that the first time I decide to change the routine I find you are in Delray. Let's all make '69." . . . **Ervin Kenison**, in Bradenton, Fla., is "still trying for life member in the American Contract Bridge League. Also playing a lot of shuffleboard and expect to make some trips up north in the spring. I see **Bob Bolan** at some bridge games."

E. D. May lives in Greensboro, N.C., but gets to Nova Scotia nearly every summer—his wife's birthplace. His son is a graduate of Brown and Southeastern Seminary, and is the pastor of the Baptist Church in Blackstone, Va. His daughter and son-in-law live in Massachusetts where he is a school principal. . . . **Wm. R. Osgood** sends the following beef: "Bigness, computers, conformity, standardization are more and more becoming the enemies of mankind, especially retired mankind. A perfectly healthy and able retired person cannot get a job because he is more likely to become ill than a younger person and this would increase the probability of upsetting the 'works'—the accounting and other administrative functions. In Washington, probably because of the small standard deviation in the population's I.Q., it is practically impossible to buy a non-nationally advertised product, however, if a nationally advertised form of the product exists." . . . As of January 6, 1967, contributions to the Reunion Gift Fund were \$82,638, compared with \$24,476 on June 30th last. . . . We regret to announce the death of **Barny Maloy** on October 11, 1966, at La Jolla, Calif.; also of **Thomas L. Goodwin, Jr.**, on November 24, 1966,

at Flushing, N.Y.; and **Sherwood Page** on July 6, 1966, after a brief illness. Sherwood had been living for the past 13 years in Marshfield, Mass. His wife died on January 10, 1967. They are survived by two daughters, Jean and Bettina.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y., 10583

'20

It is with deep regret that we must report the death of our beloved classmate, **George Burt**, on September 19 after a short illness. George's genial presence added much to recent reunions. His passing is a blow to us all, and our hearts go out to Hilda in her great loss. George was retired after a long and distinguished career in the containerboard industry. His home was in Flossmoor, Ill. . . . Belated word has also been received of the death of **Gavin Taylor** in Clearwater, Fla. No details are given. . . . **Mott Ross** is in Basking Ridge, N.J., 184 West Oak St.; **Ed Bigelow** is in Silver Spring, Md., 9704 Mt. Pisgah Rd.; "**Dusty**" **Miller** remains in Phoenix, Ariz., at 1573 W. Highland Ave.; **Sam Ruttenberg**, the distinguished educator, resides at 16 W. 77th St., N.Y.C.; **Foster Doane's** address is 501 E. Wisconsin Ave., Neenah, Wis.; **Larry Frost** is in Brooklyn, N.Y., 151 Maple St. . . . The following members of the class are among the missing and some may be deceased. Can you give us any information about them? **Merton C. Hall**, formerly of Dallas; **M. E. Perepelkin**; **Grafton Owens**, formerly of Kimberton, Pa.; **Robert A. Miller**, last heard from in Plainfield, N.J.; **Elias Sehagian**; **William H. Preston**, once in Santurce, Puerto Rico; also our old and valued friend, **Ki Chun** of Shanghai, the remembrance of whose unfailing good nature still warms our heart. . . . Perusal of the new Directory of the Alumni Association discloses that **Morris Lipp** is president of the M.I.T. Club of South Florida and we'll bet this premier citizen of Miami Beach is doing a great job of it. **Harold Hunter** represents the Institute's Educational Council in Rome, Ga., and **John Bowman** holds down the same position in Buffalo. . . . An item in the New York Times covers the death of **Henry Leigh** of 6 Peter Cooper Rd., N.Y.C. Henry had retired from a New York law firm which is general counsel to the U.S. Rubber Company. He had served with the cavalry in World War I and was at one time an examiner for the U.S. Patent Office. He is survived by his widow.—**Harold Bugbee**, 21 Everett Road, Winchester, Mass. 01890

'21

We'll tell you all about it when we get back home from the interim reunion of the class of '21 in conjunction with the Fiesta in Mexico, organized by our outstanding hosts—the members of the M.I.T. Club of Mexico City. Celebrating the 50th anniversary of the formation of '21 in 1917, the reunion marks another

in the series of pioneering "firsts" achieved by the class. Actually, it is the third of our record-breaking reunions to be held outside the confines of the U.S. That it has been most enjoyable as well as having established another new mark for other classes to shoot at, is amply attested by the many cards and letters going back to the States from a happy group of '21ers and their wives, with various versions of "We're having a wonderful time down Mexico way—wish you were here!" The Technology Review's tight publication schedule precludes presenting a description of this momentous event until the June issue. Watch for it! . . . We certainly can attest to the friendship and kindness evidenced by all of those with whom we have had contact in Mexico in arrangements for the '21 reunion. Our classmate, **Manuel Sandoval Vallarta**, wrote in detail regarding points of interest for supplementary travel outside of Mexico City and so did **Viviano L. Valdés**, who also obtained the helpful counsel of others of the M.I.T. Club. **Conchita Lobdell** wrote at considerable length and sent extremely useful data on Mexico City and recommended trips from there to other centers. A welcomed phone call from **Leon A. Lloyd** advised that he and Emma had decided to join the group going to Mexico as the first leg of a trip they were setting up to visit Hawaii. Class President **Ray St. Laurent**, who has served as the central planner for this reunion, reports phone calls from **Jackson W. Kendall** of South Pasadena, Calif., and **A. T. Eric Smith** of Montreal, P.Q., saying they and their wives were going on the trip south of the border. A subsequent letter from Jack adds that all is well with the Kendalls and they are rarin' to join the group, especially since they were unable to make the trip to Groton for our 45th Reunion last June.

Alex and **Munroe C. Hawes** were delightful hosts to Maxine and your Secretary at dinner and an evening at the Manasquan River Golf Club in Brielle. We compared notes on the respective cards we had received from Eddie and **George Gokey**, who sailed on the new Norwegian liner, *M.S. Sagafjord*, for a three-month cruise to Panama, the west coast of South America, Easter and Pitcairn Islands, New Zealand, Tasmania, Australia and other islands in the South Pacific. They expect to return in April to their home at 98 Westminster Dr., Jamestown, N.Y. 14701. One card, with a scene of Panama City, said: "Off to a smooth start, passing through the Canal tomorrow." The other one: "Thinking of you as we sail this broad and glorious Pacific, heading for Chile." In a letter to Ray and in cordial Christmas greetings to Maxine and your Secretary, they had expressed sincere regrets at not being able to attend the reunion in Mexico, and they extended regards to all. Munnie asked about the Haywards, but neither of us had recent word of them. Just in under the wire as we write these words is an interesting post card from Sarasota, Fla., with a view of the colorful cypress gardens and this message: "We're having a very small but delightful '21 reunion. Greetings from Betty and Sumner Hay-

ward and Katharine and **Larcom Randall**." A note from our enthusiastic Class Agent and Estate Secretary, **Edmund G. Farrand**, says he and Helen have now moved to their new home and their mail should henceforth be sent to 5981 La Jolla Mesa Dr., La Jolla, Calif. 92038. We all wish them well in their beautiful location plus added happiness in freedom from the management of the 3760-acre Farrand Farms in Georgia as well as in being near their son, David. They have issued a cordial blanket invitation to all '21ers to visit them in California. . . . **Philip T. Coffin** writes that he and Edna are spending the winter at 8 Parkview Apts., 660 Park St. South, Naples, Fla. 33940, and will return early in April to their home at 344 Jefferson Dr., Mt. Lebanon, Pittsburgh, Pa. 15228. . . . **Louis Mandel** reports a new home address at Apt. 2A, 175 Prospect St., East Orange, N.J. 07017. Lou heads his own firm, Mandel Products, in Newark, N.J. He has a single and a married daughter and three granddaughters, two of whom are twins. . . . **Lee J. Purnell** also gives a new home address at 1901 Quincy St., N.W., Washington, D.C. 20011. Congratulations to Purnee on having added the title of professor to his other accomplishments as a long-time member of the faculty of Howard University in the department of electrical engineering. . . . **Sidney Senzer**, advertising consultant, says he now makes his home at 114 Lawn Ter., Mamaroneck, N.Y. 10543. Sid's two sons both attended Technology. . . . **Edward W. Sherman, Jr.**, now receives mail addressed to Rt. 111, Box 248, Newfoundland, N.J. 07435. He is sales manager for the real estate firm of John A. Dailey and Company.

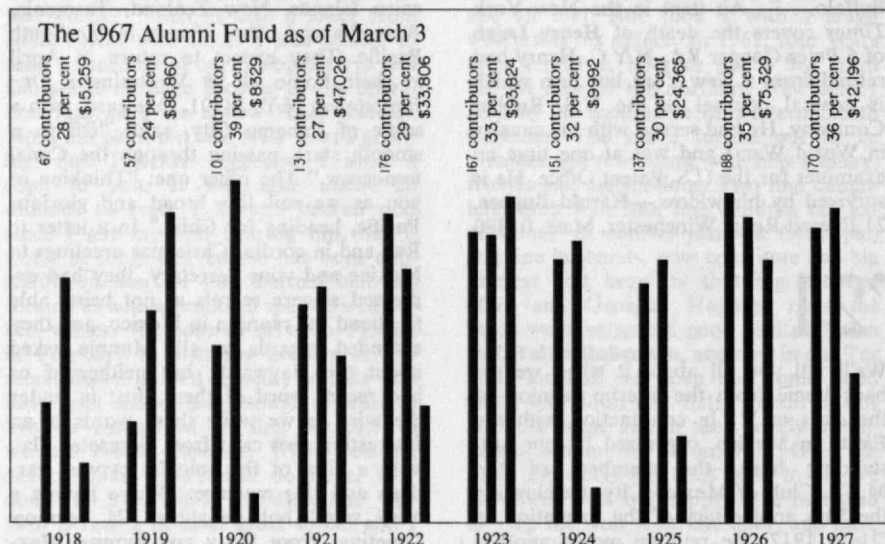
In a holiday message written from his home at Avda. del Generalísimo, 83, Madrid 16, Spain, **Antonio H. Rodríguez** says in part: "We think of you quite often and, at this time of year, we must tell you how much good and happiness we wish for you. We were very sorry to miss last year's class reunion, and yet it was fortunate we did not attend. On June 15 my mother left us forever, and we had the consolation of being at her side when she departed. We hope you are both well and we send you our best wishes." We

all missed having this wonderful couple in Groton and we send them our sincerest sympathy. . . . A personal note from India and **David O. Woodbury** of Ogunquit, Me., promises news of their recent doings "when and if the weather clears up." With the coming of spring, we hope that note is on the way, Dave. . . . Madeline and **Ralph M. Shaw, Jr.**, of Beverly, N.J., sent a handsome Christmas card with a very colorful photo of a youthful pair against a background of Mesa Verde National Park in Colorado. Says Rufe: "Our fourth trip to Mesa Verde, all of them fascinating. We have told you about it so, for now, just 'Merry Christmas.'" In another note to Ray, Rufe says they had a grand time at the Fiesta in Mexico last year and they decided not to repeat the trip this time. . . . From their winter home at 1932 N. Michigan Ave., Miami Beach, Fla. 33139, Anne and **George Schnitzler** sent us holiday greetings with a welcome note saying: "We are again enjoying the warmth and sunshine and looking forward to another pleasant winter season. We had a wonderful time at the reunion last June, and the acknowledgment by the class of your continued fine service as our Class Secretary was a most moving affair. We are expecting our daughter and her family to join us here for the holiday season, and we are now resting up before they take over! Hope this finds you both in the best of health." Here's to another good visit when we see you in Mexico City, Anne and George. . . . The greetings from **Oliver L. Bardes** included a color photograph of Ray and your scribe in a serious moment at the 45th Reunion cocktail party. The Mexico City gathering of the clan affords an excellent opportunity for us to express thanks to Olive and Ollie in person. . . . Marion and **George Chutter** are enjoying the new retirement home they built in East Dennis, Mass. George, who is chairman of our 50th Reunion Committee, promises more news of his continuing '21 activities as soon as the year-end "shouting and tumult cease."

A reproduction of a cartoon sketch of "Uncle Joe" **Horace B. Tuttle** was included for our files with a note of greetings from Betty and Sumner Hayward for

the holidays. Tut had sent it to them with his Christmas card. Trust Betty, with her Simmons library science background, to spot the fact that the new student center library at the Institute is open 24 hours a day. Interesting to read her letter to the editor of the *Technology Review* in the January issue and his reply that the library serves 11,000 people per week. . . . Laurie and **Chick Kurth's** Christmas card pictures huge white drifts, prompting Chick to observe: "This is known as 'snow.' Remember calisthenics in the Great Court when we were freshmen?" Ugh, and orchestra practice directly afterwards, with faces and fingers frozen! . . . Marty and Colonel **Bill Ready** write: "Greetings and thanks for a wonderful reunion last June. We'll see you in Mexico." . . . The usual excellent photographic greeting from the **Miller** family of McLean, Va., pictures Helen and **Bob**, their son and five daughters, daughter-in-law, son-in-law and five cute grandchildren. Bob included a note about the itinerary he planned for the reunion in Mexico. . . . Mary and **Laurence O. Buckner** used a gorgeous picture Buck made near the Continental Divide to say: "We still enjoy touring the U.S. and have been in all but one state during six trips since retirement in 1962—and we have seat belts installed! Our best wishes for Christmas." . . . Betty and **Dug Jackson** sent their wishes in verse, as is their custom, and added a most complete rhymed saga of their recent 106-day world cruise. They're joining in the '21 trip to Mexico, too! . . . Marge and **Jack Kendall** included a review of their 1966 happenings—the arrival of a new granddaughter, a tour of Alaska and several other long trips. They most generously sent us numerous mementos and philatelic gifts as well as the official programs for the Rose Parade and the Tournament of Roses game, which made our viewing of both events in color so much more enjoyable. Jack says this is the first time they have watched the proceedings on television. Active in the parade and as a member of the Tournament Committee for so many years—dating back to his youth—he says he did make a short inspection of those floats which started out a block or so from his home in South Pasadena. Thank you both, Marge and Jack. . . . A warm greeting from Kay and **Phil Nelles** included an invitation to visit their Stoneham, Mass., home. . . . We are most grateful to Maida and **Ed Dubé** for their cordial phone call inviting us to come to Reading, Mass., during Ed's convalescence to study their data on Mexico. We have again exchanged tape recordings with them, covering the Mexican tour and many other subjects of personal interest. We are glad to report that things are progressing well in Reading, and we certainly thank these two for their great interest and help in sending us such a wealth of information.

It is with deepest sorrow that we record the passing of six members of the class of 1921 and extend to their families the sincerest sympathy of everyone in the class. . . . **Leonard Russell Churchill** of 8 Riverside Dr., Cranford, N.J. 07016, died on January 9, 1963. Born in Boston



in 1894, he had lived in Beverly, Mass., and had obtained the degree of bachelor of chemical engineering from Northeastern University. He was associated with us in Course X. From 1920 to 1923 he was a research assistant on the staff of the Research Laboratory of Applied Chemistry at Technology and an instructor in chemical engineering. He then became associated with the Tidewater Oil Company as a research chemist in the refinery in Bayonne, N.J., and served in various technical capacities for 31 years, retiring in 1954. Subsequently, he was the general manager and plant superintendent of the New York and New Jersey Lubricant Company, from which he retired in 1961. A veteran of World War I, he had lived in Cranford for 30 years, where he was active in the American Legion. Len's memberships also included the American Chemical Society, the National Rifle Association, the Watchung Bowmen and the Westfield Old Guard. He was a member of the Cranford Methodist Church, where the Leonard R. Churchill Memorial Fund has been established in his memory. He had been active during his retirement in travel and in the preparation of articles for sports magazines. We are indebted to Mrs. Churchill for her help in preparing these notes and for her gracious letter of appreciation to the class for its expression of condolence. . . . **Arthur Esner** of 1144½ Huntington Dr., South Pasadena, Calif. 91030, died on November 3, 1964. A native of Wakefield, Mass., where he was born on November 22, 1897, he prepared for the Institute at Wakefield High School. At Technology he was a member of the Mechanical Engineering Society and the T.A.C. During World War I he was an apprentice seaman in the S.N.T.C. at M.I.T. He received the bachelor's degree in Course II and was associated for some years with the New Jersey Highway Commission in Jersey City, N.J. Later he served as a management engineer with the War Assets Administration in Los Angeles, Calif. At the time of his death he was a civil engineer with the U.S. Army Engineers in Los Angeles. . . . **William Frederick Boucher, Jr.**, of 167 Manchester Rd., River Edge, N.J. 07661, died on December 16, 1964. Fred was born in Newton, Mass., on April 24, 1900, and prepared for the Institute at Newton High School. During World War I he was a private in the S.A.T.C. at M.I.T. He was graduated with us in Course X and devoted his entire industrial life to the activities of Lever Brothers Company. Following graduation he was associated with the plant in Cambridge as a chemist. He held a number of positions through the years, and before his death he was a research associate at the plant in Edgewater, N.J. . . . **Foster Moore Post** of 230 19th St., Santa Monica, Calif., died on December 24, 1966. He was born in Le Mars, Iowa, on August 10, 1899, and attended Le Mars High School, the University of Minnesota, the University of Wisconsin and Northwestern. At Technology he was a member of Sigma Alpha Epsilon. He received the bachelor's degree in Course XV and became a supervisor for the vibrolithic concrete process of the American Vibrolithic Corporation,

Des Moines, Iowa. Later he became a partner with **Roy D. Snyder** in Snyder's Dairy, Bloomsburg, Pa. He was associated with the Container Corporation of America, Chicago, and, before his retirement in 1955, he directed the Foster M. Post Company, furniture manufacturers in Santa Monica. He was active in Rotary. . . . **Jung-An Lo** of 67 Hanchow Rd., Sec. 2, Taipei, Taiwan, died recently, but further details are not available. He was born in Shanghai, China, and received the B.S. degree from St. John's University in Shanghai before entering the Institute in our sophomore year. He received the bachelor's degree with us in Course II and then obtained the master's degree in aeronautical engineering at Technology in 1922. He had served for a number of years in engineering and research activities with the Wright Aeronautical Corporation, Paterson, N.J., before returning to his home, where he served as a colonel in the Chinese Nationalist Army. . . . **Walter Alexander McKim**, P.O. Box 246, Florence, Ore. 97439, died recently, but no further information has been obtained. A native of St. Paul, Minn., he was graduated with the B.S. degree from North Dakota Agricultural College in 1920. At Technology he did graduate work in Course V and received his master's degree in chemistry with us. He joined the New Jersey Zinc Company, Palmerton, Pa., in research in the paint and varnish division. He had also been engaged in technical and commercial capacities for the Jones Dabney Company, Louisville, Ky., and the Paint and Varnish Division of the Pittsburgh Plate Glass Company, Newark, N.J. Most recently, he had served as vice-president and northwestern sales manager of the Reliance Varnish Company.

Work is proceeding slowly on the Class Directory for completion in anticipation of our 50th Reunion. We do wish to thank those who have recently sent in the questionnaire form from our 45th Reunion, which is being used as the basis for the directory project. We still need replies from those whose questionnaires are missing and will gladly send you a blank if you didn't send one back last year—and you are unable to locate it now. See you at Alumni Day in Cambridge next June 12.—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, c/o Edwin T. Steffian and Associates, Inc., 19 Temple Place, Boston, Mass. 02111

'22 CLASS REUNION

June 8, 9, 10, and 11

Your Secretary must apologize to our Southern Vice-President **Frank Kurtz** for having spent two weeks in Florida including a rapid drive through Delray without calling on him. Will make it up next year! Six of us, including our children and grandchildren, enjoyed 80 degree weather and marvelous sunshine in Florida during January—then returned to 50 degree and sunny weather in Buffalo. Everyone asked why we had gone South. Buffalo has missed the storms reported in the Midwest and New England to the ex-

tent that our lagre ski area south of Buffalo has had some difficulty. Too little snow. . . . **Marion S. Dimmock** of New Britain, Conn., has written regarding a "lost document" which he sent in for safekeeping in 1965. **George S. Holderness** of Eggers and Higgins, architects in New York, asked about it. The booklet includes submissions by the class in architecture entitled "Architects not only as with Brick and Stone, but all Their Life and Fortunes as Well." Each 1922 architect was asked to fill out a page. As we leaf through its contents, we find that **Will Rice Amon** wanted to catch a girl; **Howard F. Baldwin** would bring Jno. Walker to the first Reunion from Baltimore; **Rudolf H. Blatter** of Honduras indicated "wine makes the poet"; and **G. P. Brookfield** now from New York showed that the stairs were long and steep to architectural superiority. **Rupert S. Carven, Jr.**, of Waban wrote of washing dishes and submitted poetry about money; **Mark Wesley Ellsworth** of Pasadena, Calif., wrote lyrics to Tech's song; **Warren T. Ferguson** of Newtonville wrote of structural members and rhymed: "If Uncle Joe gives me a flunk, I know damn well the stuff's all junk"; and **Roger Hayward** from Keene, N.H., now of Pasadena, looked forward to an artist's life. **Earl T. Heitschmidt** of Los Angeles said, "where ignorance is a blister, it is folly to be a rolling stone"; **George S. Holderness** of New York City remarked that "a rolling stone is worth two in the bush," seeing ahead hard work leading to clipping coupons; **Arthur L. Jones** of Tryon, N.C., explained extra-curricular activities; **Margaret Kimball** of New York City wrote "never let business interfere with pleasure"; **Dirk J. Luykx** wrote that he wanted to go to Paris. (All of this was written in 1922.) **Edward Atkinson Merrill** of Chicago submitted poems of cooperation between the architect and the engineer—which are still up-to-date in 1967. **Albert Hopkins Pierce** of Dallas, Texas, writes from the Rogers Building posting a wish, "may you keep on as you have started, and nothing stop your succeeding"; **Marjorie Pierce** of Boston felt that her office would be in the Woolworth Building; **Norman Prescott Randlett** of Laconia, N.H., indicated ease in public speaking and difficulty with mathematics; **Stanley M. Ryerson** of Belmont wrote that he would bring good news to the first reunion; **Florence W. Stiles** of Amherst certified on February 18, 1922, that "I do not expect to be made a monkey of by any man." **Bertram A. Weber** of Chicago pictured himself in bed and at the drafting table as his daily existence until finally at a big desk in a private office with the quote "one pie will not make a meal." Your Secretary will forward this booklet to George Holderness in hopes that he will start its circulation to other interested classmates.

We extend the very sincere sympathy of the class to the family of **Frederick N. Dillon, Jr.**, who died January 17. He had retired from his business in Fitchburg and, after a period of travel and entering the investment field, moved to Deerfield Beach, Fla., for the winter. Freddy was one of our most loyal classmates in attending meetings and reunions. He was a

great M.I.T. alumnus, participating in many scholarship and fund drive activities as well as engaging in local club work. He was also Class Agent from 1957-1962. He was a member of the First Parish Church, the Historical Society, Fay Club and Oak Hill Country Club. We will all miss him! . . . **Oscar H. Horovitz** has written that he will spend the winter months to April 15 in Spain, Sicily, Egypt and the Republic of South Africa. He mentioned "Buffalo snow drifts" but he must have meant Boston. . . . **Chick Kane**, '24, has been boasting about Oscar's movie of Howard Johnson's inauguration. He explained that Oscar was in top form during the showing at the Council meeting in January. Chick was sent a clipping from the Boston *Herald* which applauded the stand of Governor Reagan and proposed John Steinbeck as a qualified candidate for the University of California. It was signed by Cathleen B. and **William B. Elmer** of Boston. . . . A most complimentary article in the Boston *Globe* of November 18, 1966, tells of **Myer L. Alpert**, calling him "Mr. Modern Furniture." He chooses the best work of American and Scandinavian designers for his showrooms at Framingham and Jamaica Plain as clean-lined modern classics. However, he goes home to a Georgian house filled with 18th Century English furniture. Myer's married children, two girls and a son, live in modern houses. We are reminded that it was he who persuaded Symphony Hall's trustees in 1929-30 to replace the glaring chandeliers with lighting suitable for listening. . . . **William H. Mueser** has written of his vacation in Puerto Rico and the West Coast on business. Edna and Bill deserve a longer trip next time for a real vacation. Bill also had learned of the death of his roommate of the past, **James H. Compton** in New Haven. Our sympathy is extended to his family. Additional notices and obituary notices will be included in next month's notes. Address changes have been received and new addresses listed for **Carl B. Braestrup**, Guilford, Conn.; **G. Dewey Swan**, Greenwich, Conn.; **Charles H. Taylor**, Dover, Mass.; **Yoland D. Markson**, Los Angeles, Calif.; **Arthur H. Fischer**, New York City; **Thomas W. Alder**, Wilmette, Ill.; **Zen Zuh Li**, New York City; **Shepard Dudley**, Essex Fells, N.J. . . . May all of your winters be as pleasant as Buffalo's February at 35 degrees and sunny.—**Whitworth Ferguson**, Secretary, 333 Ellicott Street, Buffalo, N.Y. 14203; **Oscar Horovitz**, Assistant Secretary, 33 Island Street, Boston, Mass. 02119

'23

The Cleveland, Ohio, *Plain Dealer*, on February 6, 1967, says: "Retirement will not slow reliance's busy 'Doc' Smith." A picture and a long article, in part, goes on to say: "Mention the name of **Roscoe H. Smith**, and relatively few people will show signs of recognition. But refer to "Doc" Smith, and legions of businessmen in Cleveland and throughout the nation will claim him as a friend." "Doc" Smith

is the soft-spoken, sincere native of Maine who recently retired from Reliance Electric and Engineering Company after 43 years with the company, the last 22 as corporate secretary. Smith picked up the nickname as a child when he used to accompany his father, a general practitioner, as he visited his patients in a horse and buggy in Livermore Falls, Maine. Despite young Smith's close association with his father, including many a hunting trip in the Maine woods, Doc chose engineering rather than medicine when it came time to prepare for a career. 'I remembered only too well the many night calls my father had to make, and I figured that was not for me,' the now wispy-haired executive relates. 'Then I found when I got into business that there was a lot of night work there, too.' Reliance had a little get-together of 'just a few company friends' to wish Doc well on his retirement. So about 100 people were there to shake his hand—all the company officers and executives. Looking around the room one of them told Doc, 'No wonder so many people showed up. You hired more than half of the bunch.' Smith spent a year as a student at the Naval Academy near the end of World War I before entering M.I.T. to study engineering. Doc moved up in Reliance in the sales field and ultimately became the company's expert in electrical systems, particularly in the New England paper textile industries. Everyone at Reliance, except Doc himself, credits him with formalizing the company's over-all approach to drive systems. Doc's retirement is anything but a life of ease. He is board chairman of Health Hill Hospital for Convalescent Children and a trustee of the Society for Crippled Children and of Junior Achievement of Greater Cleveland. He is also a trustee of the Cleveland Automobile Club and a member of the Institute of Electrical and Electronic Engineers and the Cleveland Engineering Society. However, Doc intends to see to it that there will still be time for skeet shooting and golf at the Country Club. And, probably closest to Doc's heart, there will be opportunity for his wife Eleanor and him to spend time at their Maine oceanside cottage at Saco Bay. Doc's latest address is 21775 Parnell Road, Shaker Heights, Ohio 44122."

Herbert L. Hayden, 942 Main Street, Lancaster, Mass., wrote on February 4, 1967: "Just a line to let you know that the Haydens are still alive and kicking. We are leaving in a few days driving to Florida, and on the 19th we will fly to Mexico City and do a little touring for a couple of weeks. We plan to take in the M.I.T. Fiesta on March 9, 10, and 11. **Harry Pearson** from our class will be there. The past several months have been active ones for the 1923 class perennial athlete. I spent most of last summer playing in several senior tennis tournaments around New England and had a lot of fun (even have a rating in New England). This winter I have been playing hockey twice a week at the Groton School rink with a group of ex-college players and others, and that keeps me in shape although my muscles are sore about all the time. In addition I bowl in two leagues each week. With a few other activities

there have not been too many dull moments in this retired life. We see **Bert McKittrick** and his wife occasionally at a travel course we both attend in Boston." . . . The chairman of Watertown's (Mass.) Board of Library Trustees, **Charles T. Burke**, has authored his first book. Entitled *Puritans at Bay*, it is an interesting account of the King Philip's War of 1675-76, and is published by Exposition Press Inc., New York. Mr. Burke, veteran library board trustee and an active Boy Scout official for many years, is a native and lifelong resident of Watertown. He began an engineering and business career after receiving his master of science degree from M.I.T. Active in many organizations, he has maintained a lifelong interest in books and history. "In relating this chapter of colonial history, the author evokes the atmosphere of the time and brings to life the events and figures of that era. He wears his scholarship well, bringing to it a sense of humanity, warmth and a wry wit. General readers, as well as students of history, will find the result altogether engaging." . . . Notice has been received of the publication of a revised second edition of *Professional Engineers Examination Questions and Answers* by **William S. LaLonde, Jr.**, published by McGraw-Hill Book Company. All fields of engineering—mechanical, electrical, civil, sanitary, chemical, and land surveying—are covered by this book, designed to help examination candidates for the engineer-in-training certificate, professional engineer's license. (Bill retired in the spring of 1966 as chairman of the Civil Engineering Department, Newark College of Engineering.) . . . **Louis A. Metz**, The Country Club of Florida, P.O. Drawer 550, Delray Beach, Fla. 33444 (for summer: 1296 Hackberry Lane, Winnetka, Ill.) writes: "I retired about six years ago as vice-president and director of the Ceco Corporation. I hope to see you and many other members of the class of 1923 at our 45th Reunion in 1968." . . . **Charles Allen Geisinger**, retired engineer at B. F. Goodrich, died February 11, 1965, in Akron City Hospital after a short illness. Mr. Geisinger was 67 and lived at 2914 Cedar Hill Road. He retired from Goodrich five years ago after 25 years service. He was born in Wadsworth and lived in Summit County 27 years. He was graduated from Wittenberg College and M.I.T. He was a member of Trinity Lutheran Church in Akron and was a 32nd degree Mason with membership in Wadsworth and Lake Erie Consistory. He leaves a daughter, Mrs. Sarah G. Brawdy of Cuyahoga Falls; a sister, Mrs. W. C. Davis of Wadsworth, and three grandchildren and a brother. . . . Word has been received, but no details are available, of the death on August 28, 1966, of **Marvin W. Maxwell**, P.O. Box 54, Danville, Maine. . . . A short note to **Horatio Bond** (Bondy) dated February 3, 1967, from Mrs. **Robert V. Burns**, 902 South Greenway Drive, Coral Gables, Fla. 33134, tells of her husband's death on January 26, 1967, following a short illness. A cardiac failure was the cause, following peritonitis which developed after an op-

eration for a gangerous appendix. A letter of February 14 from **Arthur R. Stuckey**, 6161 East 15th Street, Tucson, Ariz. 85711, gives more information regarding his death. "All who were in Course I, and many in the other courses, will remember Bob and will be saddened, I am sure, by the news of his passing. His cheerful greetings and infectious good humor always enlivened the spirits of those in his company. And it was a cause for amazement and a source of inspiration to those of us who were associated with him in work or at play to observe the zeal and energy with which he tackled any new problem or activity. Bob and his wife Lillian returned to Florida late last summer after a ten-month tour of Europe which followed the completion of an assignment in Thailand on the engineering and construction of dams. This homecoming was to mark a final retirement, but the love of travel lingered on, and before Christmas I heard of plans for touring Mexico and Central and South America. Then in his last letter to me, received in January, he reported that one of his current activities was attending six two-hour classes per week in Spanish in preparation for this tour. We are so sorry that Bob and Lillian are not to make any more such trips together, and to her we extend our deepest sympathy."

The Alumni Office advises of the following changes of address: **William W. Vicinus**, 281 South Madison Ave., Pasadena, Calif. 91106; **Emile P. Jacot**, 20 Victoria St., Dorchester, Mass. 02125; **Francis A. Rood**, Chevrolet Detroit Forge Division, General Motors Company, 8435 St. Aubin St., Detroit, Mich. 48202; **Herman Swett**, 1955 Kinclair Drive, Pasadena, Calif. 91107; **Louis A. Metz**, The Country Club of Florida, P.O. Drawer 550, Delray Beach, Fla. 33444; **Peter V. Martin**, Koppers Company, Inc., Koppers Bldg., Engineering and Construction Division, Pittsburgh, Pa. 15219. —**Forrest F. Lange**, Secretary, 1196 Woodbury Ave., Portsmouth, N.H. 03801; **Bertrand A. McKittrick**, Assistant Secretary, 78 Fletcher St., Lowell, Mass. 01852

'24

Last month we told you that **Paul Schreiber** had returned to Midland, Mich., but we had no further intelligence. Now we have. It's retirement, and his short tour in Dow Chemical's Boston office was evidently a final fling. Immediately after he retired Paul helped his son operate his "Call Arthur Treacher Service System," supplying domestic help on a temporary basis. Undoubtedly Paul made a very impressive butler. But he's had to give all that up now because he's taken on another and full-time job as director of Public Relations for the Midland Chamber of Commerce. "Schreiber will concentrate the major portion of his time in direct membership contact, service, and relations," says a news release. Paul has always been active in community affairs, and he feels this is a real

challenge in a worthwhile civic endeavor. . . . In February **Marshall N. Waterman** retired from the lamp division of Westinghouse where he was staff assistant to the division marketing manager. Waddy went with Westinghouse in 1948. Prior to that time he had been with G. E., Central Hudson Gas & Electric, War Production Board, and Electrical Testing Labs. He was a lighting man all the way, and in 1956-57 was president of the Illuminating Engineering Society. All this was known to your Secretary, but another of his manifold activities was brand new. Three times in recent years he represented the U. S. lamp industry at standardization meetings abroad, in Japan, Luxembourg, and Madrid. . . . We have no idea what Waddy has in mind for retirement, but we hope he makes out better than **Gordon Billard** who tried it out last year. It didn't last long before he was back in the marketplace. "How much cards can you play?" Maybe Bill, a stock broker, should have tried Las Vegas?

Don't forget to cast your vote for politician **William Correale**. If you've received your Alumni Association ballot, you no doubt noted that William is a candidate for the National Nominating Committee from the New York region. Give him something to do with all his spare time. . . . The **Max Ilfeld**'s free time this winter was spent in Mexico. A card from Guadalajara said, "Here we are wintering in this lovely semi-tropical city, 1,000,000 people, wide avenues, palms, golf clubs, and I suppose M.I.T. graduates." The latest Register showed four alumni there, hardly enough for a major reunion. . . . As this non-scientific observer understands it, x-ray crystallographers have spent most of their time heretofore in analyzing vast quantities of data. Interpretation was a slow and tedious process. Now comes **Martin J. Buerger** with a breakthrough, an automated x-ray diffractometer. "It brings x-ray crystallography within reach of almost every laboratory," according to a report. "It will rapidly advance the study of molecular structure, especially in proteins." We've heard that the structure of many proteins has defied the efforts of researchers to date. This could mean a major step forward. A short while ago we had an address change for **Jack Hennessy** from downtown New York out to Long Island. We wondered at the time what it meant, and now comes an apparent explanation. A release from the office of Syska & Hennessy, Inc., engineers, says, "John F. Hennessy, Jr., was elected president replacing John F. Hennessy, Sr., co-founder and president since 1928, and who will now assume the office of chairman of the board." Young Jack is class of '51. So now Jack, Sr., will presumably have more time for skating, sailing, and his other varied activities. . . . We were taken a bit aback recently when a package of four books by **Henry Zeiger** arrived. We hadn't realized that Henry had taken up authoring. There were three biographies: *LBJ, The Remarkable Henry Cabot Lodge*, and *Ian Fleming, The Spy Who Came In With The Gold*. Then there was *The Seizing*



Marshall M. Waterman, '24

Of The Santa Maria. Where did a New York manufacturer find time to do all the researching books of this kind require? At last we discovered an accompanying note: "Thought you might find the enclosed writings of my son of interest." Since our Henry is Henry B., and his son is Henry A., you can understand the confusion. All but the Fleming book are paperbacks, by the way.

The St. Louis *Globe-Democrat* printed a 16-page special magazine supplement in December on: "**Charles Allen Thomas**, the *Globe-Democrat* Man Of The Year." Well, the last three pages were taken up by Christmas recipes and a super-market ad, but that's still a lot of pages on Charles Allen, Monsanto's former president and board chairman. His career as a graduate student at M.I.T. was touched briefly, but it did mention one thing that most of you have probably forgotten—for some time he was soloist with the Glee Club. On April 23, 1923, *The Tech* reported that "C. A. Thomas, vocal soloist, was the hit of the Spring Concert." And he was sufficiently serious about singing to take voice lessons in Boston. (Query: did he ever do any moonlighting? Wasn't there a famous opera star named Charles Thomas?) . . . Just received notice that **Fred Perrin** died in Rochester last August. A physicist, Fred got his Ph.D. at the University of Rochester. For awhile he was an instructor at M.I.T., then went with Bausch & Lomb. He had been with Eastman for many years. He was active in his church, Boy Scouts, and many clubs and associations.—**Henry B. Kane**, Secretary, Lincoln Road, Lincoln Center, Mass. 01773

'25

Notes of the passing of two classmates has been received during the past month. **Charles R. Wexler** died on January 12, 1967, in Newton, Mass. A news item indicated that **Harry Steinberg** passed away on January 5, 1967. Harry had been a long-time resident of Brookline, Mass., and died at the Beth Israel Hospital in Boston after a brief illness. He had had more than 30 years of service as a civilian engineer with the U. S. Navy, being stationed at the Portsmouth, N. H., Shipyard until being transferred to Boston. For many years he was assistant chief design engineer for electrical and electronic engineering at the Boston Naval Shipyard, with administrative responsibility for more than 100 engineers. He received numerous awards and cita-

tions in recognition of his creativity and contributions to the Navy, his country and his profession. . . . **Charles Cooper**, now residing in Northfield, Mass., was at the Institute in January and tried to get in touch with your Secretary, who unfortunately was out of town on that day. . . . A letter has come from **Mary Tripp** noting that she has been invited to attend the Second International Conference of Women Engineers and Scientists as a delegate. The Conference will be held in Cambridge, England, next July, but Mary is not sure at the moment whether or not she will be able to attend.

Ave Stanton has been kind enough to send in the information that on January 27 some 200 Boston Edison Company associates and wives along with Natick friends gathered at the Monticello in Framingham, Mass., to honor **George Milo Balcom** on the occasion of his retirement after many years with the company. Seeing Milo standing with one of his sons, one lady was heard to ask which was the son, and Ave feels there is much justification for such a query. Milo is presently serving on the town of Natick's Personnel Board. Before that he served some 20 to 25 years as secretary, and also as chairman of the town's Planning Board. Ave served as secretary for some five and one-half years while Milo was in the chair. Patti Page crooned the Tennessee Waltz to Milo at the party! . . . There are two short news items. **Ben Groenewold** will represent M.I.T. at the inauguration of John VanGaasbeek Elmsendorf as President of New College on February 22, 1967. . . . Also, **Ed Alexander** who has retired from the New York State Electric & Gas Corporation has been named Special Gifts Chairman for the Binghamton, N. Y., area for the 1967 Alumni Fund campaign.—**F. L. Foster**, Secretary, Room E19-702, M.I.T., Cambridge, Mass. 02139.

'26

This morning for some good reason I decided to hang photographs of **Dave Shepard** and **Jim Killian** in my hobby room. The good reason turned out to be the time I took to read what Dave had written on his photo along with his signature about 15 years ago. It reads "With all the best to 'G.W.' who does all the work—Dave." Thus a **Rube Goldberg** chain reaction was started, and when the mallet finally hit me on the head, I realized that this was the Sunday to write class notes. However, the mallet must have stunned me as well because all day while I have been doing 20 other things the thought has been haunting me—"Class notes are due." Yet, I have studiously avoided doing anything about it, and now at 4:25 I am starting with full knowledge that we have guests arriving for cocktails at 4:30. Perhaps you will get class notes this month—perhaps not. I think you will because getting started is usually the problem. Having given you this prologue, I can move on and tell you that at the Chemical Club Banquet the other night someone at the next table tapped

me on the shoulder and pointed to a man across the table who was trying to get my attention and had sent his card over. It read, "**Lyman Billings**, Research Director, Merrimac Paper Company, Lawrence, Mass." In a few quick words with Barney I took him to task for not attending our 40th Reunion. He claimed he was too busy with his work. I didn't buy that of course. Barney looked like a member of the class of '46. Perhaps it is his bachelorhood status that keeps him that way, i.e. he doesn't get over-fed. The reference we recently made to **Whit Asbridge's** method of getting his name into print (sitting in a duck blind with a man who shot a goose) really drew fire. I'll not quote Whit's entire letter, but here is quite a story from his letter: "There is really quite a bit more to the story. Mr. Olloqui, Executive Director of the Inter-American Development Bank, has done a great deal of hunting in his native Mexico and was very unhappy that there seemed to be no opportunity of hunting around Washington. He was overjoyed when I offered to remedy the situation and took him on a pheasant hunt in central Maryland, where he shot his first pheasants and was just as tickled about it as a kid with a new toy. Another bird that he wanted to shoot and at which he had never previously had a crack, was the Canada goose. I arranged to take him hunting on the eastern shore of Maryland, and when we showed up shortly before dawn, we were told that of two Cree Indian callers one had laryngitis and could hardly speak, let alone call geese, and would we share a blind with two sportswriters and the other Cree caller? It turned out that we were to shoot with Wheeler Johnson, who writes outdoor stories for the *Washington Star*, and Oscar somebody-or-other, who writes for the *New York Times*. Since Mr. Olloqui had never shot a goose and the rest of us had, we insisted that he take the first shot, which was the one that made the papers. As to other hunting this year, I am glad to say that I was able to connect with a nice eleven-point, white-tail deer, a wild turkey, a few ducks, a couple of pheasants, and I suppose a couple of dozen or so quail. Aside from hunting I have been busy at the same job of designing and building veterans hospitals, and I am about to leave for the West Coast in connection with a new one in the planning stages in southern California." All I have to add is that it is too bad that the *New York Times* writer who refers to Whit as "the fellow sitting in a blind while a visiting Mexican shot a goose" cannot read about Oscar somebody-or-other from the *N.Y. Times*. A touché for Whit. . . . A nice letter from **Stew Perry** telling us that he enjoys the notes is written on the fanciest letterhead I have ever seen. It is a composite drawing of all of Stewart's activities—sitting at his ham radio station WIBB, sailing his boat with all the family in it and detail beyond description. I looked at it under a glass and beheld some artist by the name of Smith was responsible. . . . Remember the alert police officer we had at the entrance to our driveway when you were at Pigeon Cove during reunion? He is the one who arranged to have the bus

flagged down to pick up **Bob Dawes**. His same alertness saved the life of a local youngster last week after someone phoned the police that a child had broken through the ice on Mill Pond. Arriving at the scene our friend jumped through the ice, swam to the child, and saved it. He had already had a couple of citations for bravery, and it appears that he may be recommended for the Carnegie Medal. . . . Here's a clipping we have been saving. It tells about a speech **Johnny Wills** gave some time ago, but of interest to us is his write-up. "John H. Wills, Senior Vice-president, Northern Trust Company, Chicago, will address the University Club. Mr. Wills has been with the Northern Trust Company since 1943. He became vice-president and economist in 1951, and senior vice-president in 1964. He is editor of the bank's monthly business bulletin, *Business Comment*. He was on the faculty of Rutgers and Princeton Universities, and started his business career in commercial and investment banking in Boston and New York before joining the Northern Trust Company. He serves currently as a member of the faculty of the Graduate School of Banking at the University of Wisconsin." It is interesting to catch up on John's career—also to have met Mrs. Wills with him at reunion. John was my next door neighbor in Runkle Hall and **Ed Bromilow** lived on the other side. One night Ed and I cooked it up that I would come banging into the dorms as if intoxicated. We woke John up and very solicitous he put me to bed. I'm sure that to this day he thinks I was out cold, but in those days I didn't even know what the stuff tasted like. Even on our wedding trip I took **Pete Doelger's** word that the best liquor in the world was Benedictine. Not knowing that liquor and liqueur were two different animals, I bought the Benedictine in Quebec and poured a water glass full for Ruth who took one sip and said "horrible." I took a sip and agreed. We carried the bottle all over Canada and upon stopping off with **Willard Vaughan** enroute home, we donated it to him. He accepted it with real appreciation. Willard's Christmas card this year told us that he had retired from Sun Oil in 1966. Our oil men are all retiring—Dave Shepard, **Don Green**, **Ted Mangelsdorf**—and now Willard Vaughan. Have I missed any? It's time for me to retire in a different sense, it's bedtime. So until May, Cherrio.—**George W. Smith**, Pigeon Cove, Mass.

'27 40th CLASS REUNION June 9, 10, 11, and 12

Dike Arnold wrote "We're certainly losing our good guys right and left," in sending me clippings of the death of **Hector Moineau** and **Francis Crandell**. We report these losses with regret. Deke Crandell came to Tech freshman year from Williston Academy. He was born in New York City and then lived in Boston and Cambridge. He was captain of the freshman basketball team, but his real love was hockey, in which he was awarded the "T." Eight years after graduation, most of which time was spent in the construction

business, he joined Liberty Mutual Life Insurance Company. In 1950 he married Dr. Alice Broadhurst, a practising physician at the time. In the same year he was presented the Clemens Herschel Award for research in ground vibrations due to blasting, and he also began his work in automobile safety, a joint project of Liberty and Cornell University. This resulted in the development of a safety-car which introduced many features now so prominently in the news. As an offshoot of this work, Deke was appointed to advise the National Academy of Sciences in its work on supersonic transports. At the time of his death on January 19, 1967, he was chief engineer and assistant vice-president of Liberty Mutual. His home was at 24 Beverly Road, Wellesley. . . . Hector Moineau came to Tech from Marlboro High School. He crewed for the class and was an accomplished soccer player. After graduation in Course II, he entered his family's business, the Marlboro Wire Goods Company, and headed this organization at the time of his death on December 22, 1967. His home was at 51 Mt. Pleasant St., Marlboro. During the war Ham was an army captain, assigned to ordnance research at Aberdeen Proving Ground and in Detroit. Returning to his company, he was given national prominence in 1947 when he settled a difficult 16-week strike. Virtually every reunion and class day saw Hector in attendance over the years, and his plans had included our 40th. He was a trustee of the Marlboro Hospital for many years and more recently was elected director of the Peoples National Bank.

An additional note of sadness came in a Christmas card from **Charlie Smith** in which he advised of the death of his wife, Carolyn, a graduate of Vassar in the class of 1928. . . . We have again had a fleeting word of **Wally Kwauk**. He stopped at Mallorca, Spain, for a visit with **Erik Hofman** and his wife Tibby enroute from Hong Kong to London. Erik says he is the same gay, wiry, active guy we knew 40 years ago. . . . **Charlie Sanborn** continues to work for Uncle: New York State Region of the Post Office; lives in Ossining. . . . A year ago we said that **Francis Thorne** had retired from Eastman Kodak and moved to California; now he has bought a beautiful home in Fort Worth. . . . Both of the last two items were sent in by **Glenn Jackson**. Dike Arnold in turn sent in a quote from a letter from Glenn to the effect that he is discouraged about golf (who isn't). He tried to pitch out of a "rock pile" and broke a perfectly good club. . . . The cut of **Bud Fisher** with the clocks brought an inquiry from T. E. Shepherd of the class of 1922. He has the twin of one of the clocks shown. . . . **Dan Metzger**, scouting the papers for class news, found **Dick Cheney** extensively quoted in the N. Y. *World-Journal-Tribune* as executive secretary of the Glass Container Manufacturers Institute. Dick points to the big future growth in the use of no-return bottles, which no longer require paper labels but can be directly imprinted with fast-firing ceramic inks. Dan wants Dick to call them Boom-erang bottles, but asks whether they would work at the ballpark. . . . **S. S.**

Auchincloss, president of AMP Inc., makers of solderless electric wire terminals, has also been named chief executive officer. . . . **Carl H. Anderson** has moved from Syracuse, N.Y., to Sun City, Ariz., 10026 Cumberland Drive. The last word we had, Carl was with the N.Y. Telephone Company. . . . Last May we noted that **John Vinti** was at North Carolina State University. A new address has been received at 50 Quint St., Allston.

Modern American Usage, a newly-published book by Wilson Follett, describes an undertaking of retired M.I.T. Professor **Parry Moon** to press for a standardization of scientific terms in various languages. For example, the compounds which in English bear the suffix "-ide," in Italian use "-uro." The author of the book feels strongly that the idea should be furthered. . . . This is the next-to-last chance that there will be to urge you to (A) give generously and/or additionally to the Class Gift and (B) come to our reunion. To urge you to do these two things is really to urge you to do something for yourself. Can I reiterate that there is much happiness in giving to M.I.T.? And that real pleasures await those who will be at our 40th Reunion? The older graduates universally say that the 40th is the best of all. **Joseph S. Harris**, Secretary, Masons Island, Mystic, Conn. 06355

'28

For those who missed **Bill Carlisle's** obituary in the March issue of the Review, we quote from the Boston *Globe* of January 25, 1967: "Some of the nation's leading scientists and thousands of other Massachusetts Institute of Technology graduates owe their careers to a kindly, courtly man who devoted more than 40 years to helping students help themselves. They worked their way through M.I.T. waiting on tables, working in libraries and labs, and doing other part-time, on-campus jobs arranged for them by William H. Carlisle, Jr., manager of student personnel. Carlisle, who resided at 100 Memorial Drive, Cambridge, died Monday in Mt. Auburn Hospital, after a long illness. He was 62. On Tuesday, M.I.T. administrators, teachers, and students paused in their work to pay tribute to him. 'Bill Carlisle was a person whose whole life revolved around doing things for students,' said Dr. Jerome B. Wiesner, the institute's provost. 'He was well-liked by everyone. He'll be missed.' Jim Carter, 21, president of the M.I.T. chapter of Mr. Carlisle's fraternity, Sigma Chi, said, 'You'd never want to meet a nicer guy. He always had an ear for a student's problems—and usually an answer, too.' A native of Suwanee, Ga., he was famous for originating, 32 years ago, the Assembly Ball. The annual white-tie gala is put on by his student waiters who staff M.I.T.'s Walker Memorial dining room. The ball is recognized as one of the elegant college socials in New England. 'Bill Carlisle was a real Southern gentleman, and he made that ball a symbol of Southern-style dignity and grace,' said graduate student Richard

Wright, 23, of Worcester and Arlington, ball chairman in 1965. Mr. Carlisle came to M.I.T. in 1924, after attending the University of Georgia. He was a student for four years and then became assistant manager of the dining service. One of the bright young men who worked his way through Tech as a waiter eventually became his boss. 'He was the kindest, most thoughtful person I've ever known,' said Philip A. Stoddard, M.I.T. vice-president in charge of operations and personnel. 'He was very generous; that was his style.' Stoddard said Mr. Carlisle, a slight, conservatively-dressed man who wore rimless glasses, put in 'a prodigious number of hours' counseling young people. M.I.T. President Howard W. Johnson recognized his outstanding service by giving him the Gordon Billiard Award. He leaves two brothers, John P. Carlisle 2d of Greenville, S.C., and Lt. James H. Carlisle 3d of Washington, D.C." At the memorial service held at the M.I.T. Chapel on January 25 an over-flow crowd of institute officials, student representatives, fraternity brothers and former classmates paid their respects. **Jim Donovan**, representing our class, delivered the following eulogy: "Each of us knew Bill, each of us liked him—else we would not be here. You have your favorite memories; I will mention a few of mine. There was a time, years ago, when Bill arose each morning and with a group of young men ran around the Charles River Basin. I was not one of those friends, almost certainly some are here, but many a time I have thought with warm pleasure of this serious patient activity, of the self-discipline and dedication to an ideal of living. Bill never missed a class activity. He was chairman of our 25th Reunion and will long be remembered for his activity at our 30th in arousing many about 3:00 A.M. and leading them to the hotel roof to observe a transit of America's answer to Sputnik. He was interested and sought to stimulate the interest and participation of others. One afternoon this fall I saw Bill walking along Garden Street with a tell-tale gift under his arm. He was on his way to tea with an old Tech friend who had helped him—an M.I.T. nurse as I remember. And when it came his time, he knew, and yet he was pleasant, concerned and gracious to each of us as we came to see him. A southern gentleman of the old school—a gentle man. Insofar as Bill is here with us, he is saying, 'How kind of you to come. How are the boys, Frances, Florence? Jack has been so kind to me.' And so, gentle soul, we each in our own way remember you warmly and each wish you God speed and welcome home.

From **Walter Smith**: "I had lunch today with **Kenneth Barney**, Course IV. He is chief engineer at NRC Equipment Corporation, Division of National Research Corporation (subsidiary of the Norton Company). He has been with NRC for approximately 25 years. In addition to his professional work he is much interested in church activities. He spent his Christmas vacation at Chatham, N. Y., visiting with his son Robert and Robert's wife, Judith. They have two children—a boy 3½ years and a girl

10 months old. Son Robert is with the New York State Health Department and is chief of training in the office of personnel administration." . . . From the United States Department of the Interior we learned that **Willard F. McCornack**, a career employee with the U. S. Geological Survey in Washington, D. C. since 1949, has been named that agency's executive officer. The position of executive officer includes the direction of the Survey's administrative operations—personnel, budget and finance, services and supply operations, and management and analysis. McCornack leaves the job of personnel officer, which he held since 1950. During World War II, McCornack, as an Army lieutenant colonel, headed personnel operations at the Edgewood and Huntsville Arsenals. In the post-war years he was employed with the War Assets Administration. McCornack was graduated from the Massachusetts Institute of Technology with a degree in chemical engineering in 1928. He holds masters degrees from George Washington University in economics and Harvard University in political science. During the 1930's he was an instructor in political and social sciences at Dartmouth College. The Survey's new executive officer was born at Fort Riley, Kan., in 1905. He is married to the former Catherine Kelly. The McCornacks presently reside at 5919 Overlea Rd., Susner, Md. They have a son and two daughters. . . . We thank Florence Joep for listing the Christmas cards she received from classmates last December with interesting notes in many cases: Clara and Arch Archibald; Marjorie and Bill Bendz—Marjorie just returned from the East following her father's death. Son Walter has a new baby daughter. Daughter Carol is a busy mother of four; Ruth and George

Bernat: "Yes, we have a 'date in '68' with M.I.T."; Bill Carlisle; Ruth and Chris Case; Jan and Jack Chamberlain; Marie and George Chatfield—with a picture from a summer visit of grandsons, "Ricky" Millard and "Nicky" Chatfield; Helen and Roland Earle; Huyler Ellison; Martha and Don Francis; Sally and Bill Hall; Helen and Bob Harris; Shikao Ikehara—whose new address is 2-19-20, Meguro-Honcho, Meguroku, Tokyo, Japan; Adrienne and Arthur Josephs; Louis and Ernie Knight—with a picture of their Panther Pond, Raymond, Maine home, Louise, Ernie, son Paul (North-eastern U. '69) and the wire-haired Dachshund; (Louise and Ernie visited Carol and Ben Kelsey at their Virginia farm where Ben has been raising Black Angus cattle and carrying on quite a country squire's life—a very busy and active one. Ben and Ernie have a great mutual interest in weaving, at which they are expert, producing items of great beauty for sale as well as for home consumption. Their ladies are similarly accomplished.); Janet and Fred Lewis; Alice and Slim Maeser—"Slim is consulting for A. C. Lawrence Leather and gets around quite a bit." Daughter, Dode, teaches in Montclair; King and Paul Martini; Bea and Johnny Melcher; Frances and Carl Myers; Mary and Arthur Nichols—Arthur much improved and enjoying a Florida vacation; Gladys and Dave Olken; Anne and George Palo—looking forward to seeing everyone at the reunion; Charlie Richheimer; Betty and Dud Smith—a seven weeks' trip to the British Isles in August and September was followed by a New England visit including the old haunts on the Wellesley campus where preparations were in progress for the inauguration of President Adams; Kay and Walter Smith—looking

forward to a reunion worthy of '28; Dorothy and Herb Swartz; Anne and Ford Tibbetts; Lilian and Gilbert Unverzagt; Edith and Ray Wofford; Ruth and Abe Woolf.

From a letter from Ken Brock, Director of the Alumni Fund, we learned that as of January 6, 1967, the current total contribution by our class is \$152,971.00 compared with the total on June 30, 1966, of \$108,325.00. We have a long way to go and much work to do before reaching a respectable 40th Reunion gift. . . . We had a phone call from **Lazare Gelin** recently and amongst other things he asked for **Victor Decorte's** address in Rome. Lazare planned to be in Rome about March 1. For other classmates who might be in Rome this summer, we quote from a letter that Jim Donovan recently received from Victor: "We have found a very nice apartment in a new section of Rome. It is located on a hill, and we will have a beautiful view of the countryside. We are planning a trip to the States this year, by boat both ways. This does not mean that we won't be at our Reunion next year—on the contrary. Our new address is: 38, Via Vincenzo Tiberio, Int. 6, Tor Di Quinto, Roma. . . . We have a sheaf of letters and notes from Jim Donovan and others, but we had better call it a day and present this material next month.—**Hermon S. Swartz**, Construction Publishing Company, Inc., 27 Muzzey St., Lexington, Mass. 02173

'29

We have a newsclipping about **Clark Boeckeler** of Greensburg, Pa., who was elected a vice-president of Kennametal Inc. in October 1966. Clark was associated with Kennametal since 1957 where he helped design and supervise development of the Philip M. McKenna Laboratory near Greensburg. He was in charge of this laboratory until 1962 when he was appointed research director. Clark is a member of the American Institute of Chemical Engineers, Chemists Club of New York City, American Association for the Advancement of Science and American Society of Mechanical Engineers. . . . **Arnold Conti** sent in a very complete questionnaire response. He is president of the Worcester County Institution for Savings in Worcester and is active in the Greater Worcester Chamber of Commerce, Member of Shrewsbury Industrial Development Commission, Member Shrewsbury Finance Committee, and Member National Mortgage Research Committee. Arnold entered the banking business in 1954 after a stint as structural designer and founding Conti & Donahue, Contractors & Engineers, with **Paul Donahue** who is still in the firm. During the war years Arnold served as Lt. commander, Civil Engineering Corps, administering construction of shipyards, drydocks and naval air stations in the Southeast. About his work Arnold says, "I came to the conclusion long ago that hard work may bring success, but it's much more fun to be in work suitable to your talents and often

"Street of Nets" was one of more than 30 water colors by J. Gordon Carr, '29, in a one-man show February 28-March 11 at the Grand Central Art Galleries in New York. Mr. Carr, trained as an architect, also studied at the Harvard Business School when he feared that the depression would rule out his hopes of an architectural career; but he has had a successful architectural practice in New York since 1934 and his own office since 1938.



pays off much better. I find my present job demanding, exciting, rewarding, and satisfying, with one exception—public speaking, which I have to do and dislike." He is part owner of a mortgage company in Florida where he spends his winter months. With all the foregoing activities, Arnold finds time for furniture restoring, golf and keeping abreast of the school activities of his two sons—one an athlete and the other an artist. Through Arnold we learn about **Robert Pride** who is associated with Swanson Janson Company, builders. Bob also resides in Shrewsbury just around the corner from the Contis, and Arnold compliments him in having the most beautiful flower garden in town. . . . **Joseph Green** is employed as an electrical engineer for Boston Edison Company and resides in Belmont. He is a senior member of IEEE and a registered professional engineer in Massachusetts. He has worked in electrical manufacturing, electronics and electric public utility. Joe enjoys swimming, tennis, and sailing, and we quote his observation on life, "I have concluded that good health is priceless and a good cheerful outlook makes the world a pleasant place." . . . From Foxboro we heard from **Edward Thomas** who is a patent solicitor for M.I.T., DSR Lincoln Laboratory Patent Office, and is a member of Boston Patent Law Association. His hobbies include photography, square dancing and covered bridge societies. **Everett Kelley** resides in Melrose and is chief engineer, F. Division, Champion Lamp Works in Lynn. He is active in the Illuminating Engineering Society and ASA technical committees. In reminiscing about the years after leaving M.I.T., Everett's first reaction is, "Where has the time gone and what have I done with it." Everett has been with Champion Lamp Works for over 30 years, is a frequent commuter to Cape Cod where they have a second home, and enjoys fishing, golf, antique refinishing, and boating. Everett says, "After 35 years it was nice to say hello." Having heard so many good reports about the M.I.T. Fiesta in Mexico from the **William Baumruckers**, the Riches are looking forward to attending this year. Best regards.—**John P. Rich**, Secretary, Box 503, Nashua, N.H. 03060

'30

We seem to have encountered some winter doldrums in respect to information returns, which were on the lean side this month. **Ed Giroux** reports that he is spending his spare time remodeling a 1794 Maine farmhouse that the Giroux use for vacations and plan to retire to. His latest project is fixing up a studio for his wife Mildred who is an artist. Ed is a mathematics instructor at Newton South High School. The Giroux live in Lexington and have a son Gerald who is a junior at Merrimack College majoring in psychology. . . . **E. Dudley Goodale** is with the Astro Electronics Division of RCA in Highstown, N. J., where he is project manager on certain N.A.S.A.

projects. The Goodales have two sons, Robert who is a sophomore at Bradley University in Peoria, Ill., and Walter who is in Princeton H. S. . . . **Max Wheildon's** book on *Ceramics in Machining Processes* written in collaboration with Alan G. King, a fellow Norton Company engineer, was published recently. The book discusses ceramic materials technology and tool utilization and "provides a bridge between materials science and industrial technology covering ceramic tools, tool manufacture, strength of ceramics and tool usage, tool evaluation and the future of ceramics as cutting tool materials." . . . **Worthen Taylor** has joined the staff of the northeast regional office of the Federal Water Pollution Control Administration. He was formerly director of the Division of Sanitary Engineering of the Massachusetts Public Health Department. . . . **St. George Tucker Arnold** has been appointed director of the Operational Planning and Power Division of the AEC Oak Ridge Operations. . . . **Earl Bennett** has been nominated for the position of president of the Producers' Council. . . . A Good-year Tire & Rubber Company release brings the sad news that **Jim Holden** died at General Hospital in Akron on January 24. Most of you will doubtless remember Jim best because of his many years of loyal service as our Class Agent and his annual letters pointing out the important objectives served by the Alumni Fund. After graduating from M.I.T. Jim worked for several years in the Goodyear research department, then took law at Akron Law School and moved into the patent department. At the time of his death he was assistant patent counsel. Jim was a native of Portsmouth, Va., and was a member of the Cleveland Patent Law Association and the M.I.T. Club. He is survived by his wife Eleanor and two children, Leah who is a junior at Smith and young Jim who is in Akron High School.—**Gordon K. Lister**, Secretary, 530 Fifth Avenue, New York, N. Y. 10036

'31

A recent announcement in the *Wall Street Journal* and *New York Times* tells of **Dave Bernstein's** election as president and chief executive of American Biltrite Rubber Company. Previously Dave was vice-president and director. *Chemical Engineering*, in an article titled "Tomorrow's Engineers Must be Different—But How Different" mentions **Gordon Brown's** comment that "Some engineers are prepared for the computer and will profit by it; many could be among its victims," especially in our profession which Dean Gordon Brown of M.I.T. describes as "custodians of technology." . . . Congratulations to **Harold Wilson** upon being named senior vice-president of General Radio Company. Hal has served as chief mechanical engineer, manufacturing manager, and vice-president for manufacturing. Regretfully, I report that Dr. **Louise Jordan** died on



W. Maxwell Wheildon, '30, (right) chief surface protection products, research and development department for Norton Company's Protective Products Division, presents a copy of his newly-published book, *Ceramics in Machining Processes*, to Norton president Ralph F. Gow, '25.

November 22, 1966, at Mercy Hospital in Oklahoma City after a long and painful illness.—**Edwin S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn.

Deceased

FRANK R. COOK, '96, February 11
ROBERT A. DAVIS, '96, January 6
JAMES G. LEIPER, JR., '99, December 29*
WILLIAM D. CROWELL, '02, January 16
RALPH G. HUDSON, '07, January 1
EDWARD NEWHALL, '10, February 15
FRANK A. SCOTT, '10, 1966
L. GORDON GLAZIER, '11, February 16
THEODORUS POLHEMUS, '11, February 12
EDWARD B. COY, '12, September 1*
EARL E. FERRY, '12, January 29
PHILIP G. LAUMAN, '12, January 22
DANIEL RICKER, '13, November 1
KENNETH W. MACPHERSON, '17, September 5
HARRY N. SANDELL, '17, February 25
ALLISON R. WILLIAMS, '17, August 10*
GARDNER E. JOHNSON, '18, October 19
CHARLES B. MALOY, '19, October 11*
SHERWOOD PAGE, '19, July 6*
GEORGE H. CUTTER, '20
JAMES H. COMPTON, '22*
FREDERICK N. DILLION, JR., '22, January 17*
JOSEPH C. PATTY, '22, January 13
ROBERT V. BURNS, '23, January 26*
JAMES W. DANIELS, '23, November 3
CHARLES A. GEISINGER, '23, February 11, 1965*
JAMES A. HENDERSON, '23, January 26
FRED PERRIN, '24, August 28*
ARNOLD B. BAILEY, '25, February 19
ANTHONY A. LAURIA, '25, February 11
SIDNEY H. BAYLOR, '26, January 25
JOHN A. RUSSELL, '28, December 28
JAMES B. HOLDEN, '30, January 24*
MADISON M. CANNON, JR., '31, January 23
FREDERICK A. CORNELL, '32, March 26
WINTHROP H. TOWNER, '32, February 20
LEONARD SHAPIRO, '34, January*
SAM C. RUSSELL, '40, December 31
FRANKLIN D. MABBETT, '43, February 6
MRS. ELEANOR KARASAK SHURE, '47, February 11

*Further information in Class News.

Folks, when you read these notes spring will surely be here, at least in some places. But as I write (in Florida) we read about the terrible storms and cold weather in Colorado and Minnesota. . . . I have a press release from the U. S. Atomic Energy Commission on what is called "Remarks by **Rafford L. Faulkner**, Director of the Division of Raw Materials." Rafford is a classmate that I have never seen that I know of, but he is on the ball. His speech was delivered at the International Nuclear Industries Fair and Technical Meetings at Basle, Switzerland, in September. It is titled "United States Uranium Resources and Requirements for Civilian Power" and is complete with thoughtful text and documented with proper statistics and graphic charts, almost 20 single-spaced pages long. It cannot be covered here, and hence we do not even try. But I have written Rafford to see if we can get some personal material with which to supplement the speech, probably for use in the May issue. If any classmate is interested, I have the complete article, with identification, so that we may obtain such copies as are requested. I am filing the speech, something which I seldom do. It is good. . . . We are again saddened by the passing of another classmate, **Rodney D. Chipp**, December 27, 1966. At the time Rodney was acting in consulting capacity with I. T. & T. Company, the National Association of Broadcasters, the National Television Systems Committee, and the T. V. Broadcasters All Industry Committee. He was formerly director of engineering for Allen B. Dumont Labs, and then for I. T. & T. He was a pioneer in the development of radar and was active in radar development work, both as a civilian and later as an officer in the Navy, from which he was discharged as a lieutenant commander at the end of World War II and awarded the Navy Commendation Ribbon. Rodney is survived by his wife, Dr. Beatrice A. (Hicks) Chipp, who is also an engineer, and by one son who is presently in the Navy. I know that all those who knew Rod will join me in offering Mrs. Chipp our most sincere sym-



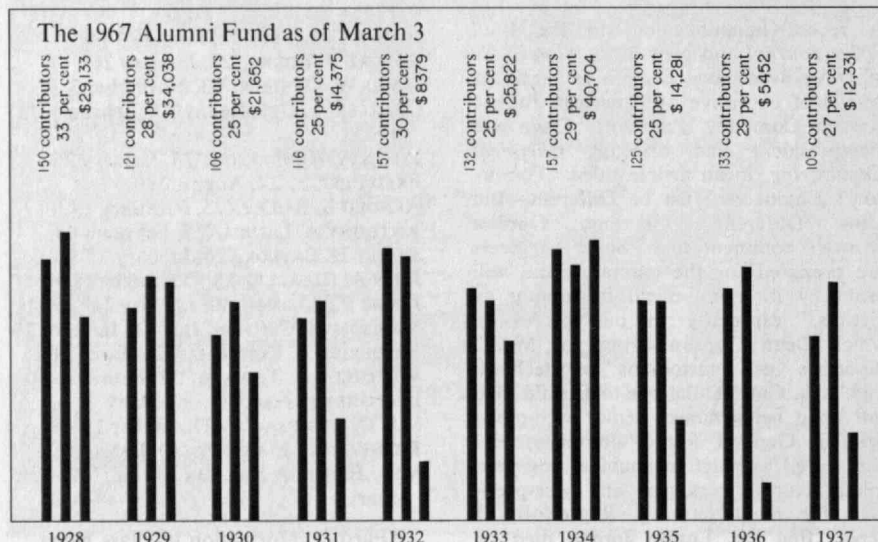
Richard S. Morse, '33, new member Board of Trustees, Research Analysis Corporation.

pathy. . . . **Cal Mohr** came through with two letters written the same day, one of news of classmates and the other of a more personal nature. He hears that **Skee Sysko** (Adam to some of you) failed to see his son during the Christmas holidays, as the Air Force at Camp Hood wouldn't let him away. It seems that Mrs. Sysko was in Italy and made it away from Florence just ahead of those terrible floods. She had been visiting the Sysko daughter, of whom no further mention is made. Skee keeps in touch with the Institute by serving with the Alumni Educational Council, a very large group of dedicated fellows who work pretty much unsung as advisors to prospective students who express an interest in M.I.T. They also act as liaisons with the many secondary schools. Cal also makes mention of the **George Hennings'** Christmas card which was a clever review of the Hennings' 1966 year, in which they celebrated their 30th wedding anniversary, made several trips, including the Mexico City M.I.T. Club Fiesta, and the Chief Executives Forum at Del Monte Lodge, Calif., and Point Clear, Ala. I do believe that George is getting younger and all because of those lovely girls of his, including the more than lovely Lucy. . . . **Gordon Pratt** is the new medical service director for the State of Michigan, hence has moved from Big Rapids to East Lansing. M.I.T. men are nothing if not versatile; here is an architect becoming a medical director.

Many a Secretary has done some wondering just what the card file of the Class Roster really amounts to. A few weeks ago I received what looked like a routine request for an address from **Gus Martin**, Signode Corporation, Chicago. He wanted the address of **Outerbridge Horsey**,

XV, (NR). Outer we never hear from, except indirectly, and we never hear from Gus either and it didn't occur to him to say one word about himself. Prompted, he sent me a copy of his letter to Outer, and a short note for me. It appears that *Time* and some local newspapers had made some mention of Outer at an earlier date. So Gus wanted to know if Outer is an ambassador to Czechoslovakia, as the Department of State in Chicago says yes and the *Chicago Tribune* says no. Gus and Elinor are planning a short cruise on the *Ankara*, a Turkish ship, for two weeks on a "Swan" tour of the Aegean Isles, and Greece, leaving the ship at Venice. And they are taking an eight-day motor trip to Duvrovnik via the Dalmatian Coast, then north through Mostar, Sarajevo, Banja Luka, Zagreb, to Graz and Vienna, then a plane to London and home. With the trip planned in advance, all Gus wants of Outer is a few suggestions of a more personal nature than that found in the Yugoslav literature. I asked Gus where he got the nickname, and he said in effect, what would you do if you were saddled with the name, "Hollinshead T." So, and I quote, "I have been Gus since I was 15 years of age, by choice. Horsey and I belonged to the same fraternity, Phi Psi, hence the plaintive query." Gus avers that he does not, in answer to my question, own Signode. The company is publicly owned. Elinor has two children by a former marriage, and Gus has two; Andy, Elinor's elder, graduated from Rollins two years ago; Lynn, his daughter, graduated from Northwestern last June; and the remaining boys are still in college, one at Wisconsin and one at Ripon, also in Wisconsin. So Elinor and Gus are now sort of recovering from the "calamity" of having four children in college at the same time. Gus mentions his nostalgic sickness when the autumn season in New England rolls around. . . . A little prodding shook loose from **Harry Summer** some news of himself and family. He also sent a card at Christmas. He is still merchandising children's clothing at the Lerner Shops, but the boys are too big now and buy elsewhere. Joel will enter Illinois next fall, Jack will be a sophomore in high school, and both are doing well. The family group is busy with community affairs, as well as Temple activities. The Summers are planning on the 35th if they can possibly make it. Thanks for being so thoughtful, Harry, and please ask any classmates that you meet to "go thou and do likewise."

I find myself in a real quandry, following some research into the Review readers picture. Briefly, we have a total of 840 listed. Of these there are about 300 who took advanced degrees at the same time we graduated as bachelors. Less than half of the men and women who took their bachelors in 1933, or who attended the Institute as part of our class, are readers of the Review. I try to mention all names presented to me whether or not they are readers, but with my new list I can afford to mention non-readers less often and use less copy. Before this school year is gone, I have every intention of writing to every non-reader in the list. As all Secretaries have discovered, I can't make the boys



reply, even when I pay the postage, but I know I can get more than enough new readers to pay for the postage. The more readers I turn up, the more replies and mature observations come in. Address changes seem to have slowed down, with only seven this time around. Any of the faithful who so desire can get any or all of these changes by writing your secretary, but the letter must include personals of interest to others of us. Perhaps it has been noticeable that the interesting facts from classmates are not those included in Joe Doak's speech to the Amalgamated Brewers. The best notes are personal facts in the daily lives of the men and women themselves. That gives me a chance to make these notes chatty and more human. The list of address changes: **George V. Sweetnam**, XV; **Donald R. Smith**, I (NR); **Walter D. Teague, Jr.**, II; **Otis L. Shurtleff**, XV (NR); **Frank M. Labouisse**, IV, (NR); **Frederick V. Murphy**, XV.

After I had typed my name to this tome, I received a short one from **Winthrop W. Adams**. He lives in Barrington, R.I., where there is a fine little school called Barrington with religious overtones. However, Win has no connection, or if so, no mention. He is still employed by the Advertising Department of the BIF Division of the New York Air Brake Company in the Providence office. Win was Course XV, and is in advertising. This is not too far fetched, but it is not common. He is a new addition to the 1933 Grandfathers Club, what with two daughters, one a teacher in Boston and the other married and living in Washington. She has furnished Win with two grandsons. He is an ardent watch and clock collector. We are a family of non-working clock people ourselves but none of us has ever become a collector. Are there any other collectors of these items among the gentry? I am sure that Win would like to hear from any who are.

And now, the last but far from least was a phone call at noon, February 1, from our esteemed Executive Vice-president **Jim Turner**, who is also general chairman of the 35th Reunion Committee. Less than a month ago Jim was quite discouraged. He had written seven letters and had had only one reply, and that one was a negative. He was trying by mail to form the many subcommittees needed for any reunion and was getting nowhere. My only offering was, "Jim, go see these fellows." Jim attended the recent dinner meeting of the Alumni Council, visited around a day or so, and came up with five chairmen of his subcommittees as follows: **LeBurton Webster**, Chairman of the Publicity Committee; **Fred Murphy**, Chairman of the Program Committee; **Clarence Westaway**, Chairman of the Arrangements Committee; **Roger Congdon**, Chairman of the Attendance Committee; and **George Stoll** (our esteemed Treasurer), Chairman of the Finance Committee. It is difficult to see how Jim could have done much better! And our 35th is now a guaranteed success. Incidentally, since closing the deal with Mr. McMullen, Manager of the Chatham Bars Inn, I have enclosed 75 post cards of the Inn in mail to classmates, though some may have been duplicates. If all goes

as it seems, I will have to ask Mr. McMullen for another hundred cards. Even with a top-notch committee and superb chairmen we now have to sell the Reunion to many, sometimes reluctant, classmates, though how this can be is hard to understand.—**Warren J. Henderson**, Fort Rock Farm, Exeter, N.H.

'34

Paul Wing, Jr., appeared on the National Education Television, NET, network recently in a half-hour show discussing his collection of parlor stereoscopes. The show, one of a series on antiques, was made at Durham, N.H., but is being shown throughout the country. . . . **Ruth Pfeiffer MacFarland** of our class and her husband **Charles H. MacFarland** who took his master's with us in '34, have a son Charles graduating from M.I.T. this year with an unusual second bachelor's degree. He first received a bachelor's in physics also from M.I.T. and now is "one of the first genuine humanities majors" according to a feature article about Charles and the Course in the *Christian Science Monitor*. The *Monitor* article goes on to say, "According to Mr. MacFarland the main value of the new program is the broadened outlook it provides a science or engineering student." The *Monitor* also quotes Drs. Douglas and Lamson who developed the Course, "The students in this program are not just escapees from science. They are bright students who usually continue into graduate work and do quite well. The object of the new program is to create a new version of liberal education—an emphasis on humanities with a scientific base. Liberal arts students often have little background in science. And students graduating from a heavily science-oriented school frequently have only a passing acquaintance with cultural subjects." "Dr. Douglas and Dr. Lamson contend that a knowledge of both culture and technology will be increasingly important in the future. They believe the scientist must be able to communicate with the humanist, and vice versa. Dr. Douglas's Humanities Department is 75 faculty members strong. He says it is larger than the entire faculty of a few small liberal arts colleges. All M.I.T. students are required to take certain basic courses in literature, history, and the arts. When they reach the sophomore level, they are expected to choose a major." . . . **Leonard Shapiro** died on January 8 after a long illness. He had retired from the Beacon Company two years ago because of heart trouble. However his mind was active, and so he continued to do consulting work for that company and others from his home. He collaborated with two M.I.T. professors on a *Thesaurus of the Textile Industry*, which will shortly be published. Leonard's noncomplaining temperament was well-known to his friends; but even so, it is a bit startling to hear his wife say that he lost his temper with her only once. This was a month before he died when he wanted more pain-killing medicine and she withheld it until she could ask the doctor.

His son Joel is studying for his doctorate in math at Ann Arbor and intends to teach at the college level. His daughter Marjorie is working in an architectural engineering office and living at home. She will soon be married to an architect, and they hope to live in the Boston area. His wife Beatrice is living at 295 Harvard Street, Cambridge, and will look for an activity in adult education, probably in the teaching of such things as weaving and knitting. She has a wonderful spirit that will help her look after herself, yet there is little doubt she would want to hear from Leonard's old friends.

John C. Hawkins has been promoted to manager of the newly-formed Industry Marketing Department of the Foxboro Company. Formerly senior branch manager at the Wilmington, Del., office, Mr. Hawkins will be working with all areas of the company in the development of the industry marketing function. John received his B.S. in chemical engineering and joined the Foxboro Company in 1948. He became branch manager at Wilmington in 1959. He is a member of the American Institute of Chemical Engineers, the Instrument Society of America and is a registered Professional Engineer in Massachusetts. . . . **George H. Priggen, Jr.**, Greenwich, Conn., has been named marketing manager for Mobil Latin America, a regional service company of Mobil Oil Corporation with offices in New York. His appointment is effective February 1. George received his B.S. degree in business and engineering administration and joined Mobil that year as a service station salesman. Among his more important posts in the North American division have been manager of the Midwest and New York State divisions, and manager of the planning and development department. He has been manager of the corporate design and graphics department since 1965. . . . **Daniel Smith**, Course VIII, is listed as a co-inventor for Interchemical Corporation of an electrostatic powder gravure printing process. The development came out of Interchem's Central Research Labs at Clifton, N.J. . . . A recent *Wall Street Journal* story on the death of Mr. Mallincrodt, principal stockholder in the Mallincrodt Chemical Works, stated that **Harold Thayer**, Chairman and President, was named in the will as one of a five-man director committee who have been given voting power for at least 15 years in order to preserve the "Continuity of management."—**Norman B. Krim**, Secretary, 15 Fox Lane, Newton, Mass. 02159; **W. Olmstead Wright**, Secretary, 1003 Howard Street, Wheaton, Ill.; **Jamees Eder**, Secretary, 1 Lockwood Road, Riverside, Conn.; **George G. Bull**, Assistant Secretary Mid-Atlantic, 4961 Allan Road, Washington, D.C. 20016; **Kendrick Lippitt**, Secretary, 8735 Delgany Ave., Apt. 211, Playa Del Ray, Calif.

'35

Ham Dow reports from his new home at 1097 Fleetwood drive, San José, Calif. 95120, that Class President **Allan Mowatt** personally delivered the President's

trophy to him in recognition of his winning the class golf tourney for 1966. Allan visited Ham and his wife Edith at their temporary motel quarters; he arrived the day after Ham and Edith reached the coast following their eight-day motor trip. As noted in the February Review, Ham has transferred to G.E.'s Atomic Power Equipment Department which builds nuclear "boilers" for electric power generating plants. Allan Mowatt must be the best Class President that a dilatory Class Secretary ever had to work for. He writes the Secretary monthly tendering newsy morsels and prompting against the horrible idea that there might be a month without class notes for 1935 appearing in the Review. His February letter reports on his meeting with Ham and Edith Dow and continues, "The next night, January 24, I had dinner with Verna and **Gerry Rich** in Santa Cruz. They have a lovely home on the 13th Fairway of the Pasatiempo Golf Course. For some time prior to late this last fall Gerry has been commuting to Los Angeles where he was running a small company. However the owner sold out, and Gerry is currently trying to find the right situation, between consulting jobs, that will enable him to get a new product of his finally developed and on the market. Both of the Rich's look well and happy with life in California. In fact they do not want to have to move from where they are, and I can hardly blame them. I have talked with **Ned Collins** several times recently. He is back in Boston again, and he thinks this time he will stay awhile. The tight money situation caught up with his latest nursing home plans in Elmhurst, Ill. I shall be at the IEEE in New York in late March and will report on any '35-ers I run into."

Cornelius J. Wilson has resigned from his position as assistant technical director of the National Oil Fuel Institute (NOFI) to accept a post as assistant director of the Research and Development Department of the Division of Engineering at the University of Rhode Island, Kingston, R.I. He joined NOFI in 1965 as Eastern Field Coordinator. . . . **Perry Ware** is now manager of power systems engineering on the corporate engineering staff of Simplex Wire and Cable Company. He is responsible for long-range voltage developments in high-voltage cable for power transmission. . . . **William I. Thompson** teaches at the Institute. He has published articles and poems in various journals. His book, *The Imagination of an Insurrection: Dublin, Easter 1916*, has just been released. . . . Selected at random, will the following members of the class please write to Irv Banquer. We need material in these notes from every member of the class:



Walter J.
Maguire, '37

Karl Achterkirchen, John Bainbridge, Lou Birchall, John Chapman, Gale Forsen, Sidney Fox, Roger Hammond, Dick Hughes, Fred Kraus, Harold Oshry, Darrell Root, Lars Sjodahl, Charles Taylor and Vin Ulrich.—**Irving S. Banquer**, Co-Secretary, 20 Gordon Road, Waban, Mass. 02168

'36

Through the Alumni Office I have been informed of the death in January, 1963, of **James L. Camp** of Dallas, Texas. Although this was not news to me, I have checked and note that this has not previously been reported in these notes, and I do not remember the source of my information. I would appreciate further information from any reader who can supply it. . . . In January the keynote speaker at the opening dinner of the New England Conference on Evangelism was The Reverend **Claxton Monro**, rector of St. Stephen's Episcopal Church in Houston, Texas. . . . **Norman Cocke** has been named manager of sales planning of American Viscose with which he has been associated since 1939. . . . **Bob Gillette**, President of the Rock of Ages Corporation, has been reelected to a four-year term as a director of the National Life Insurance Company of Vermont. Bob has been a director since 1953. . . . In February **Bill Shockley**, Professor of Engineering Science at Stanford, spoke on "Mental Tools for Scientific Thinking with Application to Semiconductors" as a part of the colloquium series of the Department of Electrical Engineering at Columbia University. . . . **Lee Tolman** writes from Moline, Ill., when sending a contribution to the Alumni Fund that he is now chief of the Quality Assurance Office at Rock Island Arsenal. . . . **Harry Easton's** address is 30 Burning Tree Rd., Greenwich, Conn. 06830. . . . I have discovered that it may take two months for a clipping to be routed to a Class Secretary. That is how long it took for the information to percolate back to me that in December I served as chairman of the Christmas Sale of the Association of M.I.T. Alumnae. . . . If you want your news reported more promptly, please send it directly to me.—**Alice H. Kimball**, Secretary, 20 Everett Avenue, Winchester, Mass. 01890

'37 CLASS REUNION June 9, 10, and 11

Joe Keithley writes that his firm, Keithly Instruments, Inc., Cleveland, Ohio, is building a new office and factory in Solon, a Cleveland suburb. They have started selling directly to customers in Germany and also have started an assembly operation there. Joe plans to attend our 30th Reunion. . . . **Bill Bergen**, President of Martin Company since 1959, has resigned. He joined Martin Company as a vibrations engineer in 1937, became vice-president of engineering in 1951, vice-president of operations in 1953, executive vice-president in 1959 and president later that year. . . . **Lawrence Hough**

has been appointed executive vice-president of the Veeder-Root Company, a unit of Veeder Industries, Inc. He had been vice-president of the manufacturing division of the Singer Company. . . . **Les Klashman** has been named director of the newly-created northeast region of the Federal Water Pollution Control Administration, an agency of the Interior Department. He will supervise federal water pollution activities in New England, New York, New Jersey and Delaware. . . . **Walter Maguire** has been appointed director of projects, international operations, of the Dorr-Oliver Inc., Stamford, Conn. Walt joined Dorr-Oliver recently after several years as project manager with the Lumus Corporation. He has had extensive experience in corporate strategic planning. As engineering director of Daniel, Man, Johnson and Medenhall in Los Angeles, he has undertaken complete environmental analyses—economic, technical and financial—for several Asiatic and Latin American countries. He has also advised major corporations in the United States and elsewhere on major business ventures. . . . **Jerv Webb** has recently been elected president of the Detroit Athletic Club. Jerv is president and general manager of the Jervis C. Webb Company of Detroit, Mich. . . . **A. W. Chandler**, of Tulsa, Okla., President of Chandler Engineering Company, recently presented a paper, "Test Instruments for Pressure Moisture Content and Supercompressibility" at the 14th annual Gas Measurement Institute held at Liberal, Kan. Hope to see you all at our 30th Reunion this coming June.—**Robert H. Thorson**, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Professor **Curtiss Powell**, Assistant Secretary, Rm. 5-325, M.I.T., Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

'39

Brigadier General **Leo A. Kiley**, X-B, commander of the Air Force Missile Development Center, Holloman Air Force Base, New Mexico, has been nominated by President Johnson for the permanent rank of brigadier general. In his present assignment Leo is responsible for the development and coordination of programs in five mission areas: the directorates of test track, guidance test, aircraft and missile test, technical support, and foreign technology. . . . **David P. Triller**, II, is supervisory general engineer at the U. S. Naval Avionics Facility, Indianapolis, and one of the leaders in thin film technology development at NAFI. He recently received a \$100 award for a patented invention concerning a pattern mask for use in making thin film circuitry. David has several other patents to his credit. . . . An Atomic Energy Commission release indicated that a public hearing was scheduled for February 23 to consider a Consumers Power Company application to build a nuclear power plant near South Haven, Mich. The release stated that one of the three members of the Atomic Safety and Licensing Board to conduct the hearing

was **Charles E. Winters**, X-A, of the Union Carbide Corporation's Parma Research Center, in Cleveland. . . . **Myron H. Nichols**, VIII, a nationally-known figure in telemetry circles and an industry consultant, has been appointed program vice-chairman of the International Telecommunications Conference for 1967. He has taught at Princeton, Michigan, and CalTech, and has published 19 prime technical works in telemetry. . . . **Myer M. Kessler**, VII, at the Institute, is involved with real-time, or on-line computer control of circulation records for library catalog indexing, according to a brief item in the June, 1966, *Journal of Documentation*. . . . Those of us who knew **Maynard K. Drury**, XV, will be saddened to learn of his death on December 10, 1966. Other than the note which Kitty (Wellesley '39) sent to the Alumni Office, I have no other details. Maynard had been president of the Dryad Die Casting Corporation, North Avenue, Manchester, N.Y.—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

'40

Herb Holloman has been designated Under Secretary of Commerce. . . . **Francis Bittel** is now assistant general sales manager of the Youngstown Sheet and Tube Company. . . . **Charles Stokes**, who is vice-president for technology and planning of Columbian Carbon Company, is the author of an article on "Strengthening the Research-Marketing-Finance Team" in *Research Management* magazine. . . . **Herb Weiss** gave a report on the Camroc antenna and radome studies at the program of the Northeast Electronics Research and Engineering Meeting. Camroc is the Cambridge Radio Observatory Committee and has recently proposed construction of the world's largest steerable antenna, a 400-footer, in New England.—**Alvin Gutttag**, Secretary, Cushman, Darby & Cushman, American Security Building, Washington, D.C. 20005

'41

Jack Kriz says that in his 30,000 mile yearly driving on business he has seen so many big trailer trucks stuck in viaducts that he has decided to do something about it. As a result he has invented and patented a device for mounting on a vehicle and which sounds an alarm when it makes contact with an overhead obstruction. It has two antennas, one shorter than the other. When a driver approaches a viaduct or overpass and the clearance is suspect, he slows down but remains in the cab. If an alarm sounds, he knows that the taller antenna has made contact and he is a pre-set distance from the underside of the obstruction. If he proceeds forward and the clearance decreases to the extent that the lower antenna makes contact, the brakes are automatically applied. In such case the driver can get out from under

by backing up, unless he throws a master switch to "off" and bulls it through. Jack had headed for southeast Asia in 1941 to work for a Dutch subsidiary of the Standard Vacuum Oil Company based in Java. After the Japanese attacked Pearl Harbor, he went to Australia where he joined the U. S. Army and saw combat in New Guinea. He now resides in Skokie, Ill. . . . **John W. Meier** has been promoted from chief engineer to department manager of the industrial products department of Hamilton Standard division of United Aircraft Corporation. John joined Hamilton in 1946 as a senior metallurgist. In 1960 when the division entered the electron beam equipment field, he was named chief engineer to head the department's engineering activities. He presently resides in Suffield, Conn. . . . **George F. Quinn** is one of three members of the Atomic Energy Commission's headquarters staff presented the AEC's Distinguished Service Award for meritorious contributions to the United States nuclear energy programs. George is assistant general manager for plans and production and received the award which consists of a gold medal, a certificate and a citation. It is the highest honor that the AEC can bestow on its employees. George's career in nuclear energy began in 1942 with successive assignments as chemical engineer at the SAM Laboratory, Columbia University, the Metallurgical Laboratory at the University of Chicago and the Clinton Laboratories at Oak Ridge, Tenn. From 1946-48 he was an instructor in chemical engineering at Columbia University. In April 1948 he joined the staff of the AEC as an industrial engineer in the division of production; he was named production planning engineer in 1951, chief of the reactor products branch in 1952, assistant director for operations in March 1954, deputy director in 1955, and director of the division of production in 1959. Two years later he was appointed assistant general manager for plans and production. He contributed significantly to the development of the private ownership bill which was enacted into law on August 26, 1964. This measure eliminated a requirement of the Atomic Energy Act that the Government own all special nuclear materials within or under the jurisdiction of the United States and permits these materials to be owned by private individuals or organizations. He was born in Lawrence, Mass., in 1920, received his B.S. in chemical engineering from M.I.T. in '41 and M.S. in '48 from Columbia, and resides with his wife and 10 children near Mt. Airy, Md.

William K. Hooper, senior vice-president, has been elected executive vice-president of Republic Foil Inc. Bill, a native of West Orange, N.J., served as a captain in the Army Signal Corps during World War II. He joined Republic in 1956 as manager of the company's high purity etched foil operation and at the same time supervised the firm's research and development program. In 1958 he was elected vice-president and in 1960 appointed to the position of vice-president, marketing, followed in 1962 by appointment to the position of senior vice-president. He is a director of Republic

and also of the Anderson Power Products Company, Boston. He is also a director in the Aluminum Association. He resides with his wife and five children in Brookfield, Conn. . . . **Alvin H. Hartman** has been elected to the board of governors at the annual meeting of the National Association of Small Business Investment Companies held recently in New Orleans. He is also serving the Association as chairman of its Management Services Committee. He is vice-president and a director of Narragansett Capital Corporation, Providence, R.I., one of the country's largest small business investment companies, and is chairman of the board of the Denver, Colo., based microfilm publishing company, Information Handling Services, Inc. He resides at 25 Jefferson Rd., Wellesley Hills, Mass. . . . **Robert Fano** was mentioned in a December 20, 1966, *Wall Street Journal* feature article on computers of the future as envisioning systems linking school computers to students' homes. Assignments programmed in the computer would be printed out on a teletypewriter in the home. The student would transmit answers back to the computer which would check them and either repeat troublesome points or move on to the next assignment. Such an arrangement would let each student proceed at his own pace. Robert, a professor at M.I.T., directs a computer time-sharing setup for engineering faculty and students at M.I.T. . . . A meeting of your Local Standing Committee was held at the Faculty Club on Wednesday, February 15. Those present were **Ed Marden**, **Reid Weedon**, **Mitch Marcus**, **Nat Sage**, **Fred Watriss**, **Bud Ackerson** and **Leona Zarsky**. It was voted to have a regional social in April. Check Ed Marden for details.—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass.; **Everett R. Ackerson**, Assistant Secretary, 16 Vernon Street, South Braintree, Mass.; **Michael Driscoll**, Assistant Secretary, City Hall, Nantucket, Mass.

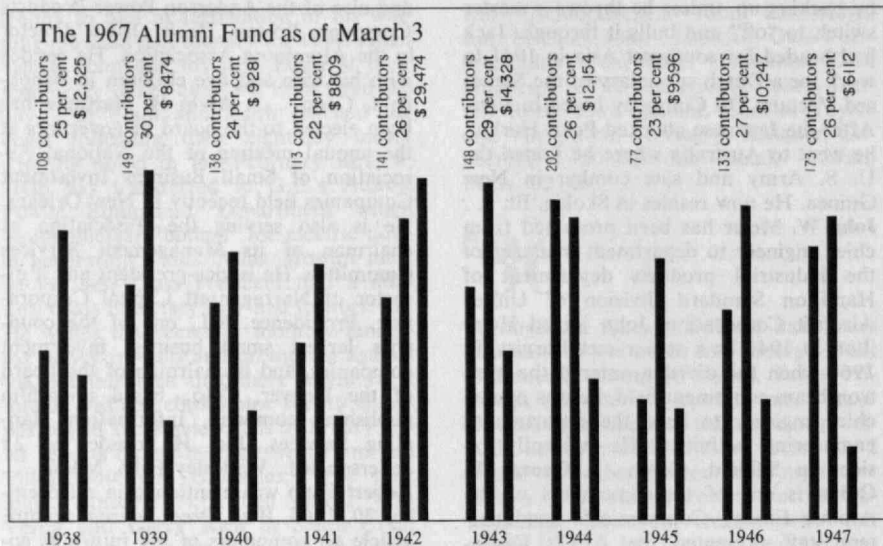
'42 25th CLASS REUNION June 9, 10, 11, and 12

About the most important thing I can mention in these notes this month is the great activity of the Reunion Committee. I suspect that every class feels that its reunion is going to be the best ever, and

Captain W. O. Powell, Jr., Commanding Officer, Naval Avionics Facility, Indianapolis, presents invention award to David Triller, '39.



The 1967 Alumni Fund as of March 3



I am sure that we all feel this way about ours. Actually it is difficult to see how one could be much better, as the planning and thought that is going in to this one ensures that it will be a great success. Ken Brock of the Alumni Fund sent me a summary of how our class stands as of January 6, 1967, with a comparison of our total at the end of the previous year. As of January 6, 1967, our total was \$142,196, an increase from \$117,960 last year. We still have quite a way to go to catch up to the class of 1941 which came in with a total of \$354,900 last year. Even this is quite far behind the record set by the class of 1935 of \$641,656 last year. During the past eight months we have circulated three complete mailings to our class. In due course we have learned to our chagrin that a significant number of addresses were not current and were so old that mail was not forwarded by the post offices. Through assiduous follow-ups we have tracked down all of you who are reading this column and many others in addition. There are, however, 18 men and women of the class of 1942 who have disappeared. If any of the readers of this column know the whereabouts of the following, please invite them to our Reunion in Cambridge on the Institute campus from Friday, June 9, to Monday, June 12, 1967. If you can write us with one or more current addresses, so much the better. The traceless ones are as follows: Colonel Ralph L. Clary, Robert R. Close, Belmont G. Farley, Mrs. Lisa M. Finney, John F. Gallagher, William E. Hense, Jr., Gordon H. Hill, Lt. William J. Kotsch, Major William L. Molo, Major Roger H. Olson, Warren H. Powers, Mrs. Orland B. Reynolds, T. W. Gilmer Richardson, Charles B. Smith, Marvin N. Stein, Edward P. Todd, James C. Turnbull, C. F. B. Wilding-White. . . . The only news note I have about a member of the class concerns **Lee Martin** who is president of NIBCO, Inc. He has been appointed to ASA's Standards Council, representing the Manufacturers Standardization Society of the Valve and Fittings Industry (MSS). Lee has been president of NIBCO since 1957. Hope to see you all at the reunion!—**John W. Sheetz**, Secretary, 45 Rutledge Road, Belmont, Mass. 02178

'43

John E. Ward was appointed deputy director of the Electronic Systems Laboratory at M.I.T. After serving as an engineer in the Radiation Laboratory during World War II, he joined the Servomechanisms Laboratory (later the Electronic Systems Laboratory) staff in 1945 as a research assistant. Over the years he has held positions in the Laboratory as project engineer, executive officer, and assistant director. John's early research was in the area of radar and automatic control as applied to fire-control systems. Later he led the group responsible for the development of digital inflight instrumentation and its associated computerized data-reduction system for fire-control equipment. More recently he has devoted his efforts to the development of graphical displays for computer-aided design on time-sharing machines. Active in professional society activities, he has served as chairman of the IEEE Automatic Control Group, and as president of the American Automatic Control Council. He is currently the AACC liaison representative to the governing board of the American Federation of Information Processing Systems. As deputy director John will assume a considerable part of the laboratory administrative responsibilities. . . . **E. Alfred Burrill**, vice president of High Voltage Engineering Corporation, has been appointed manager, Western Region, and given the responsibility for establishing a new regional sales office to promote the corporation's equipment sales in the 13-state western region of this country. He joined High Voltage in 1947 as a physicist. He was named director of technical sales in 1954 and vice-president and sales manager in 1957. In 1960 he assumed the responsibilities of director, marketing. Prior to joining High Voltage he was a research assistant at M.I.T.'s High Voltage Laboratory under Dr. R. J. Van deGraaff. Al received the Naval Ordnance Development Award in 1945, and the Charles B. Dudley Medal from the American Society for Testing Materials in 1949. He was the Lester Honor Lecturer of the Society for Nondestructive

Testing in 1961 and has published numerous papers and articles. . . . **Irene duPont, Jr.**, was elected a vice-president and member of the executive committee of the DuPont Company. He is a great-grandson of Eleuthere Irene duPont, founder of the 165-year-old company, and a son of the late Irene duPont, who was president from 1919 to 1926. He started with the company 20 years ago as an engineer at the Arlington, N.J., works and worked up through supervisory positions at the Washington Works, Parkersburg, W.Va., and the Belle Works, Charleston, W.Va. He has been at the company's headquarters since 1953 when he was named to the planning division of the polychemicals department (now the plastics department). In 1957 he was advanced to director of the department's technical services laboratory. He was transferred to the film department in 1961 as assistant production manager. He became assistant director of the employee relations department in 1965. In 1963 he was elected a term member of the Corporation of M.I.T. He is a trustee of Tower Hill School, the Mt. Cuba Astronomical Observatory, Inc., and the Longwood Foundation. He is a member of the boards of Wilmington Trust Company and the Christiana Securities Company. Irene and Barbara live in Montchanin and have five children, Mrs. J. Thomas Light, Irene 3rd, Cynthia, Sally Carpenter, and Grace duPont. . . . I received a note from John Babcock, class of 1910, advising us that **Virgilio Barco Vargas** is currently mayor of Bogota, Columbia. Many of you will recall that over the years Virgilio has served as an ambassador and more recently as minister of public works for Columbia.—**Richard M. Feingold**, Ritter & Berman, 266 Pearl Street, Hartford, Conn. 06103

'44

We are in better shape this month than last with regard to the supply of news. We have several clippings from the Alumni Association, the 1966-67 Directory of the Alumni Association (not the Alumni Register) has arrived, and Class President **John Hull**, Ivyland, Pa., has written to announce the recruitment of **Robert S. Faurot** of Chicago as 25th Reunion Gift Chairman. In a letter dated January 31 John writes, "I had a good meeting in Chicago in January with Bob Faurot and **Al Picardi**. Bob will be our 25th Reunion Gift Chairman, and Al will be working very closely with him in the Chicago area and elsewhere. Both Bob and Al have occasion to travel throughout the country and can be very instrumental in making the program successful. At the moment we are planning on a meeting in Boston in mid-February. As the program gets into high gear, we will be appointing area chairmen and other personnel to assist in making sure that we have a direct person-to-person contact with every active classmate to ensure maximum participation in the Class Gift contributions, and maximum encouragement of each classmate to attend the 25th Reunion." John adds that

"the Class Gift is building up magnificently thanks to increased giving by essentially all of our regular contributors and to some exceptionally fine gifts from a few of our very successful classmates." He indicates that we should set a substantially higher goal than the \$200,000 with which we started the campaign a few years ago. John's statement regarding the Class Gift is substantiated by a memorandum of January 25 from Ken Brock, '48, Director of the Alumni Fund. Ken says that on June 30 our gift stood at \$70,427. As might be expected, we had a cumulative total lower than the class of '41, '42, or '43 (being closer to their 25th Reunions), and we had a higher total than the class of '45 which still had four years to go. Six months later (actually, as of January 6) our gift had jumped to \$175,169—higher than either the class of '42 or '43 at that time but still a long way from the most recent gift of \$354,900 from the class of '41 in 1966 or the record gift of \$641,655 from the class of '35 in 1960. **Norm Sebell**, Lexington, Mass., our Class Agent, has been acting as 25th Reunion Gift Chairman. With regard to the 1969 Reunion itself **Burt Bromfield**, Weston, Mass., agreed last September to serve as Chairman (see November notes). I spoke with Burt in mid-January, at which time he was contemplating a vacation or at least a trip on which he was going to concentrate on 25th Reunion plans. The primary and proper interest of your Secretariat in talking up the Alumni Fund in these notes is to get maximum participation in terms of numbers of contributors because our first concern is with readership. Unless alumni contribute to the Alumni Fund, they are not normally on the circulation list and are not therefore exposed to these golden words. Our interest extends to inactive members, and we hope that the Reunion Gift campaign will bring many of them into the fold as readers or even contributors (editorial, that is). Speaking of active and devoted alumni, Bob Faurot is hardly a newcomer to being active in the Alumni Association. He is not only an Educational Councilor—he is chairman of that activity for the Chicago region. In view of Bob's newest activity you had better have his address. It is Western Felt Works, 4115 Ogden Ave., Chicago 60623. I know he would be glad to hear from any of us. With **Al Picardi** as president of the Chicago club, **Lew Tyree** as secretary (see February notes), and Bob Faurot as regional chairman of the Educational Council it would appear that the class of 1944 is contributing mightily to the efforts of the Alumni Association in that area.

Now to the clippings: from the New York Times of December 28 we learn that **James Woodburn** of Wheaton, Ill., has been elected a corporate vice-president of AMSTED Industries, heavy equipment manufacturer. Jim joined AMSTED's Griffin Wheel operation in 1955 as a research metallurgist. He was named Griffin's director of research in 1960. In December 1961 he was appointed director of research at the AMSTED Research Laboratories and became president there in 1963. In addition to his new post he remains as president of AMSTED Research

J. Karl Justin, '48

Laboratories. After receiving his bachelors degree in metallurgy in 1946, Jim returned to Tech for a B.S. in business and engineering administration. . . . By a clipping of January 4 from the Rutland, Vt., *Herald* we learn that **Hugh M. Taft** of Springfield, Vt., was to explain magnetic memory drums for the members of the Twin States Chapter, American Society of Tool and Manufacturing Engineers at a meeting to have been held January 11. In the biographical section of the write-up we learn that in 1960 Hugh left Bryant Chucking Grinder Company to form Vermont Research Corporation, where he has since served as president. The article further states that at the Bryant Company Hugh was chief engineer of the Gage and Spindle Division which later became the Computer Products Division of Ex-Cell-O Corporation, now Bryant's parent company. . . . The Milwaukee *Journal* of January 12 reports that **Warren J. Harwick** has been named research and development director of Rex Chainbelt, Inc. Warren joined Rex Chainbelt in 1965 as manager of research and development after leaving General Electric at Schenectady, N.Y. . . . From the Springfield (Mass.) *News* of November 9, we learn that **Richard C. Grant**, Northeastern regional production manager at United States Envelope Company, was to be guest speaker at a meeting of the Western Massachusetts Chapter of the American Production and Inventory Control Society. Dick's topic was to be "Computer Control Systems at USE's Williamsburg Plant." Notice how frequently computers become involved in these news items? Would anyone be interested in forming within the class (or within the Alumni Association) a special interest group on computer technology? As I have mentioned before, I am teaching a course in systems analysis (for computer applications) at the Northern Virginia Community College one night a week, so I have a special interest in corresponding with others on the "computer revolution." . . . I am still perusing the new Alumni Association Directory. Clearly our class is well-represented in the many activities of the Association, particularly the Educational Council. But at this writing there

John G. Farrow, '48, product applications manager, nylon, Celanese Plastics Company.



is not time to complete that analysis. All of the members of your Secretariat are still waiting for your phone calls, postcards, and letters, especially **Jack Barmby** who just informed me that he broke his leg on February 8 while skiing in Pennsylvania.—**Paul M. Robinson, Jr.**, Secretary, Navy Department Program Information Center, Pentagon 4D683, Washington, D.C. 20350, 202-OX5-0351 or 7710 Jansen Dr., Springfield, Va. 22150, 703-451-8580; Assistant Secretaries: **Paul M. Heilman, 2d**, Copper Development Association, 405 Lexington Ave., N.Y. 10017, 212-867-6500 or 30 Ellery Lane, Westport, Conn. 06880, 203-227-3469; and **John G. Barmby**, IIT Research Institute, 1200 17th St., N.W., Washington, D.C. 20036, 302-296-1610

'48

Albert J. Kelly, deputy director of the Cambridge Electronic Research Center of NASA, has been elected a fellow of the IEEE. . . . **Michael J. Bajor**, supervisor of quality control at the Inland Steel Chicago Heights plant, has been elected to the Hazel Crest, Ill., board of trustees. . . . **John R. Kirkpatrick** has joined American Cement Corporation, Los Angeles, as vice-president and director of corporate development. He was previously vice-president of Arthur D. Little, Inc. . . . Our new Special Gifts Chairman for the Boston area is **George H. Wayne** of Newton Centre. His son, Charles A. Wayne, is a freshman at M.I.T. this year. . . . Those who are interested in radar astronomy or who have followed the adventures of Millstone Hill over the past decade will appreciate **Gordon Pettengill's** article, "Radar Astronomy," which appeared in the October '66 issue of *International Science and Technology*. . . . Professor **W. D. Kingery** has presented a paper "Development of Microporosity in Aluminum Oxide Thin Films" at a meeting of the American Ceramic Society and has published a paper, "Dislocation Dependence of Cationic Diffusion in SrTiO₃," in the associated journal. . . . **J. Karl Justin** has been named a partner in Fordyce and Hamby Associates, a New York firm of architects and engineers. . . . **John A. Hughes** is the '67 technical chairman for the ISA Aerospace Instrumentation Symposium. . . . **J. J. Kotlin** has been appointed assistant chief engineer at the Electro Motive Division of General Motors, La Grange, Ill. He joined EMD as a test mechanic immediately after graduation. . . . **William A. Lockwood** has been appointed a senior vice-president of New York's First National City Bank. . . . **R. S. DeBell** is a senior project engineer with DeBell and Richardson, Inc., plastics consultants, and is secretary of the SPE Engineering Standards Committee. He has recently authored "An Overview of Quality Control in Plastics" in the *SPE Journal*. . . . **Robert Turkington** is quite an active amateur musician. He has played regularly with the Melrose and Concord orchestras and is currently first trumpet of the Concord Community Band and second trumpet of the Middlesex Brass Quintet. The latter group has pre-



Rai Y. Okamoto, '51

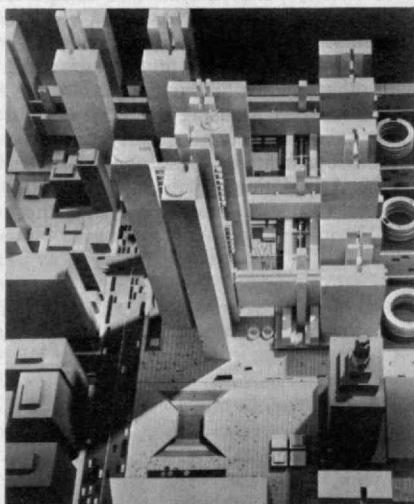
sented concerts at the Sears Gallery in Waltham and at the Gardner Museum in Boston. . . . Had a very enjoyable phone conversation last week with **D. H. Nelson**, whom I recently discovered has been with Lockheed since graduation. Don and his wife and two children reside at 1020 N. Sixth St., Burbank, Calif. . . . Kudos to the Alumni Association for sending the clippings by first class mail as requested. The Pony Express simply hasn't been getting them here in time to meet the deadline. —**R. V. Baum**, Assistant Secretary, 1718 E. Rancho Dr., Phoenix, Ariz. 85016; **John T. Reid**, Assistant Secretary, 22 W. Bryant Ave., Springfield, N.J. 07081; **Robert R. Mott**, Secretary, Kent School, Kent, Conn. 06757

'49

Every month M.I.T. sends along to the Class Secretaries bits and snatches of news about all of you men out there. And every so often a photograph is included in the batch. So, quick as a wink, I open my yearbook to see what you looked like 18 years ago compared to now. And would you believe it, you are a handsome lot and unmarked by the ravages of time. Take **Ed Cluff** for instance. The only difference that I can detect between his yearbook picture and the one I have before me is the necktie. That plus the big smile he has in today's picture. The biographical note from the DEL-CHEM Bulletin of Wilmington, Del., traces Ed's career with DuPont from the beginning in 1952 just after he had earned his Ph.D. from Tech. He spent two years in national defense teaching at the Chemical Corps School, Fort McClellan, Ala., and doing research on nerve gases at the Chemical Center in Maryland. He returned to DuPont's Jackson Lab in 1954 and transferred to the experimental station when the Elastomers Research Lab was constructed. The little piece stops painfully short of telling us all we'd like to know. . . . **Harry M. Walton** represented the Institute at the Centennial Convocation at Morehouse College last February 18. Morehouse is a small men's college in Atlanta, Ga. Harry works in Atlanta for the Olin Mathieson Chemical Corporation. . . . **Eugene Skolnikoff** is the author of a thought-provoking article titled "Scientific Advice in the State Department" in the November 25, 1966, issue of *Science*. Gene is associate professor of political science at Tech. From 1958 to 1963 he was a member of the staff of the special assistant to the president for science and technology. The article deplores "The apparent inability of the Department of State

to fill the vacancy in the Department's chief science advisory post—that of Director of International Scientific and Technological Affairs." The article is an absorbing discussion of the impact of scientific developments on diplomacy. . . . Our old friend **Pete Cambourelis** of Lexington, Mass., has been appointed manager of program development, scientific satellites, at Avco Space Systems Division. He will be chiefly responsible for program development of orbiting satellites to carry scientific instruments, primarily for astronomical studies by universities, astronomical observatories and the National Aeronautics and Space Administration. Pete has also been named acting manager of management information for the Space Systems Division all in Lowell, Mass. In this capacity he will help establish procedures to coordinate technical, marketing and financial aspects of program development for all division business lines. . . . **Sanborn Philip** was co-author with Professor John Trump, '33, of the Institute of a paper on "Compressed Gas

Rai Y. Okamoto, '51, is the principal designer of this concept for a city center for Oakland, Calif., which has won a citation in the 14th annual design awards program of *Progressive Architecture* magazine. The winning design, prepared for the Oakland Redevelopment Authority, is a first step in the city's long-term urban planning program; it includes a 55-story office-hotel convention facilities, a repertory theater and new cinemas, a concert hall, high-rise office buildings, and retailing, restaurant, and service establishments. The city center is proposed "as a concept of what the form of a metropolitan center might be, a vital, effective, pleasing area in which to live," according to Mr. Okamoto. "Major movement systems are expressed, horizontally and vertically, for vehicles and pedestrians, and the enclosures for these systems, where required, become major visual elements. There is also provision for flexibility and change, and the modifications will produce both the visual variety and the spatial change an urban environment must have." Mr. Okamoto practices in San Francisco in association with William H. Liskamm.



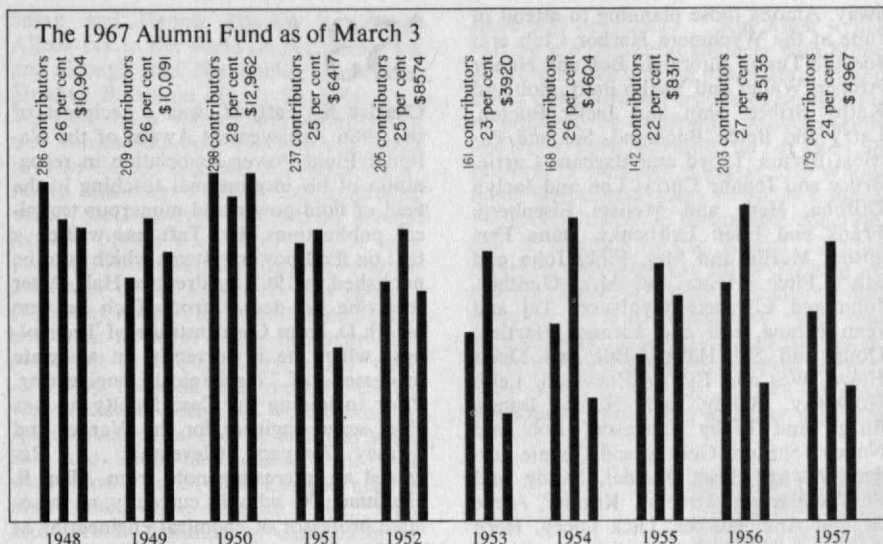
Insulation For Electric Power Transmission" which was presented before the Conference on Electrical Insulation last October in Pocono Manor, Pa.—**Fletcher Eaton**, 42 Perry Drive, Needham, Mass. 02192

'51

James H. Banister, Jr., is head of contract administration for Physics International, a research organization. Jim and Saralee have five children, Jeffrey 9, Jimmy 8, Mark 7, Robbie 5, and Douglas 3. . . . **Jack H. Barcinski** lives in Glenlock, N.J., with his wife Joan (Goodhue) and their two children, Derek 7 and Amy 4. Jack is vice-president of marketing for the Fleischmann Division of Standard Brands, Inc. Spare time activities include bridge, tennis and membership in the Sales Executive Club and Association of Cereal Chemists. . . . **Bill Benfer**, wife Nancy, and children, Paul 6, Patti 10, and Sherry 13, have just moved into their new home in Dallas, Texas. Bill is production manager for the Apparatus Division of Texas Instruments. . . . **Priscilla Burrage** is a technical editor for IBM in Fishkill, N.Y. Her husband Peter also works at IBM. . . . **Jules Davis** is president of Karco-Davis, Inc., general contractors. Jules registered disappointment at the fact that Course XVII, construction, is no longer given. He felt that with a little advertising among new students it could have been popular. Jules and Janet live in Scarsdale, N.Y., with their two children. . . . Carolyn and **Edward Dawson** have two children and live in the Greenfield, Mass., area where Ed works for Du Mont. . . . **Col. William Dienst** was one of 180 outstanding senior officers selected for special study in management of logistic resources for national security at the Industrial College of the Armed Forces at Fort Lesley McNair in Washington. . . . Gwendolyn and **Charles Fargo's** family include three youngsters from Charles 3d, 11, to Peter 8, and Sarah 1½. Charles is a vice-president with Hunneman & Company (industrial real estate) in Boston. He enjoys sailboat racing in the summer and duck hunting in the fall. . . . **Fred Fead** is with the Shaw Construction Company in Denver, doing residential and commercial building. . . . **Lt. Col. Joseph J. Garvey** was awarded the U.S. Air Force Commendation Medal for meritorious service. Joe is a pilot and part of the Military Airlift Command. . . . We have a lot of military men in our class. **Col. Ernest Graves**, U.S. Army Corps of Engineers, is currently on duty in the Pentagon. He was honored in October by the ASCE (Civil Engineers) for the outstanding paper in *Civil Engineering* magazine. The article was entitled "Nuclear Excavation of a Sea Level Isthmian Canal." . . . **Robert J. Greaney** joined the management sciences department of EBS Management Consultants in Washington, D.C. . . . **George Hano** is a project engineer on the Apollo project. He lives in Huntsville, Ala., with his wife, Doris, and their four children, Beth 16, Michael 14, Ellen 10, and Paul 1 year plus. . . . **Er-**

win Harris recently moved to Woburn, Mass., where he changed his professorial affiliation from the physics department at Carnegie Tech to Lowell Technological Institute. He is currently initiating a Ph.D. program in physics at Lowell Tech. . . . Gladys and Maurice Hedaya have two girls and two boys ranging in ages from 4 to 13. Hedaya & Company Inc., Maurice's venture, is best known for their novelties including the "Rat Fink" (with a genuine raccoon tail), dolls, animals, and music boxes. All of these items are sold under the "Holiday Fair" trade style. . . . Anne and William Hewitt honeymooned in Hawaii last year. Bill is still with Carbon Products, a Division of Union Carbide. He transferred from Seattle to Bowie, Md., last year, and if all goes well, Bill and Anne will vacation in Norway this summer. . . . Jacob C. Hill, is a chemical engineer for Hunt Foods and Industries in California. He and Jean have three children, Linda 10, Carl 7, and Susan 4.

Betty and Charles Johnson have four children, Robert, Stephen, David and Jayne, 13, 11, 9, and 4 in that order. Charles works for Hopeman Brothers in New York City and lives in Harrington Park, N.J. . . . Breene Kerr represented the Institute at the Oklahoma State University inauguration in October. . . . Nancy and Peter Kimon live in Connecticut. Peter works for ESSO International in New York City (another commuter). . . . Pauline and Laurance McPheeters have three boys ranging in age from 12 to 1½. Laurance is in the Engineering Department at DuPont in Wilmington, Del. . . . Edward Monz is with Barstow & Mulligan in Boston, Mass., in the Highway Engineering Department. Ed is one of the few bachelors left in our class. . . . Another, Donald Reis, is with Grumman Aircraft as LEM GSE support planner. His concern is with Apollo and Lunar excursion aspects of the moon trip. Don had been with Norden Division of United Aircraft prior to this assignment. Don was at the Alumni Officers' Conference last September along with the following additional members of our class: Marvin Grossman, Chuck Hieken, Fred Lehmann, Howard Levingston, Gil Lewis (who, incidentally, accepted the Bronze Beaver Award at the conference for his Washington, D.C., M.I.T. Club for their outstanding work), Bill Maini, Forest Monkman, Peter Philliou, George Siefert, Hank Spaulding, Bob Wedan, and Harry Zimmer. . . . Barry O'Brien is now the controller at Iowa-Illinois Gas and Electric Company in Davenport, Iowa. He and Mary Lou have an 8-year-old son. . . . Allen Odian is with the Linear Accelerator Center at Stanford University. He resides in Palo Alto with his wife Elizabeth. . . . Dr. Norman C. Peterson is an associate professor of physical chemistry at the Polytechnic Institute of Brooklyn. While Norm is busy doctoring, wife Maxine takes care of Eric 8, Curtis 6, Linnea 3, and Karl about 1 in their Staten Island home. . . . A note from Sandy Sussman indicated that he is a vice-president of Solitron Devices on Long Island (although I have heard rumors that he left them very recently).



Sandy and Marlene have two boys, Stephen 8 and Jordan 4. Incidentally, Sandy lists his hobby as "the stock market." I don't know how many of you have watched Solitron Devices on the American Exchange, but it moved from about 30 to the equivalent of over 300 (they effected a split) in about a year, and it did it sometimes 20 or 30 points a day! . . . Bill Sutherland is a vice-president twice over, once for the Griffin Wellpoint Corporation and once for the Griffin Foundation Drilling Corporation, both of Houston, Texas. While Bill punches holes in the ground, Barbara rides herd on Bill Jr. 13, Nancy 12, Jimmy 10, and Joan 4. . . . Michael Tinkham was appointed Gordon McKay Professor of Applied Physics at Harvard University as of last July. Wife Mary is a Professor of Applied Diapers for son Jeffrey who is less than a year old. . . . Peggy and Bernard Varney live in Casper, Wyo. Bernard is vice-president of International Insurors, Inc., general agent for Western States Life Insurance Company, and secretary-treasurer of Central Wyoming Life Underwriters Association. . . . Phil Zaccheo forsook the bachelor life last August when he married Jean Lynne Cuneo. Congratulations to you both. Phil is senior soils engineer with Tippetts-Abbett-McCarthy and Stratton in New York. And the news this month was once again brought to you by—Walter O. Davis, Assistant Secretary, 346 Forest Ave., Brockton, Mass.; Howard L. Levingston, Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: Marshall Alper, 1130 Coronet Ave., Pasadena, Calif. 91107; Paul G. Smith, 11 Old Farm Rd., N. Caldwell, N.J. 07007

'52 CLASS REUNION

June 9, 10, and 11

Interesting coincidence department—last January Gerry Laufs and Dave Ulrich met by surprise in Sydney, Australia. Gerry, who is stationed in Hamburg, Germany, had come to Sydney for a three-week assignment to help Esso Exploration with various natural gas sales problems. He met Dave, who likewise was on

a temporary assignment to assist Esso Australia with sales development. Dave's duty base is in New York City with Esso Standard Eastern in the manufacturing department. Thanks for the letter. . . . From Anaconda, American Brass Company in Waterbury, Conn., comes word that John P. Lynch, Jr., of Cheshire has been appointed research administrator of their research and technical center in Waterbury. He was formerly metallurgist for the Ansonia Division. . . . Brenton R. Groves writes us that he has spent the last three years at Ohio State University completing his Ph.D. and has returned to Goodyear Aerospace as a senior engineering specialist. His field of dissertation covered computer-generated motion pictures of antenna field patterns. . . . On the political side, John B. Mattson was reelected to his second term as a representative in the Legislature of New Mexico, receiving over 70 percent of the votes cast in his district. Do not have the details as to where exactly or what else John is doing, but congratulations. . . . John R. Dixon is head of the Department of Mechanical Engineering at the University of Massachusetts. John holds his B.S. and M.S. from M.I.T., his Ph.D. from Carnegie Institute of Technology and had formerly been teaching at Swathmore College. . . . Major Brian G. Moore has completed the U.S. Air Force counterinsurgency course at the Air University, Maxwell A.F.B., Ala., and has been reassigned to George A.F.B., Calif., as a member of the Tactical Air Command. Major Moore holds an M.A. from the Air Force Institute of Technology at Wright Patterson A.F.B.

J. Burgess Jamieson, Jr., is now chief development engineer with Honeywell Corporation Computer Control Division in Framingham, Mass., and while this is being written (February), he and Libby are somewhere off Barbados cruising the Caribbean and missing lots of ice and snow. For Class Agent Stan Sydney, it's his own company—the Sydney Construction Company, Inc., with offices at 20 Kent Street, Brookline, Mass., specializing in industrial construction. Reunion is now getting closer, and when this column appears will be less than two months

away. Among those planning to attend in June at the Wychmere Harbor Club are: Joe and Tunny Alibrandi, Bob and Nancy Archer, Walter and Yaeko Bailly, Bob and Kathy Briber, Stan and Jacky Buchin, Larry and Bettie Buckland, Sid and Patricia Byrum, Lloyd and Barbara Currie, Bruce and Joanne Curry, Lou and Jaclyn DiBona, Herb and Melissa Eisenberg, Frank and Ellen Fairbanks, Dana Ferguson, Martin and Mrs. Fink, John and Mary Fitch, Heinz and Mrs. Gunther, John and Elizabeth Gyulveszi, Taj and Jean Hanna, Bill and Eleanor Hartley, Doug and Sal Haven, Bill and Doris Hawe, Wes and Estelle Haywood, Leith Holloway, Sandy and Nancy Isaacs, Burge and Libby Jamieson, Bob and Nancy Johnson, George and Connie Jordan, Al and Fran Kandel, Sandy and Phyllis Kaplan, Arnie A. Kramer, Arnie G. and Ann Kramer, Dick Lacey, Herb and Carla Lebovitz, Ed and Sherry Lipinsky, Bob and Nancy Lurie, Dana and Odile Mayo, Claus and Emma Meissner, Nick and Jacky Melissas, Dana and Betty Morse, Mike and June Nacey, Ed and Theresa Neumann, Russ and Dorrie Olive, Ed and Sue Porter, Gus and Clovia Rath, John and Clara Rydz, Jere and Audrey Sanborn, Mike and Helen Sapuppo, Bob and Iris Sax, Ed and Luz Selig, Paul and Mary Seever, Dick and Joyce Silverman, Stan and Sue Solomon, Stan and Sheila Sydney, Steve and Dorothy Sussman, Jim and Estelle Weissburg, John and Margaret Young. . . . Summary: as we go to press, more than 100 reservations from 13 states, the District of Columbia, and Canada have been received. Obviously this 15th is a reunion you'll not want to miss, and remember—it is the last 15th you'll be able to attend! If you haven't already, do return your questionnaire and reservation in the envelope provided. All for now.—**Dana M. Ferguson**, Secretary, P.O. Box 233, 242 Great Road, Acton, Mass.

MITRE Corporation's expanding operations in Washington, D.C., combining the Defense Communications Agency and Air Traffic Systems into a single organization, will be headed by Charles A. Zraket, '53 (right), Vice-president, who will report to Robert R. Everett, '43, Vice-president in charge of Technical Operations.



'53

Charles K. Taft, II, was a recipient of the 1966 Achievement Award of the National Fluid Power Association in recognition of his inspirational teaching in the field of fluid power and numerous technical publications. Dr. Taft has written a text on fluid power systems which is to be published in 1967 by Prentice-Hall. After receiving his degree from Tech he won his Ph.D. from Case Institute of Technology, where he is currently an associate professor of mechanical engineering. Prior to joining the Case faculty he was chief servo engineer for the Warner and Swasey Company, Cleveland. . . . Received an interesting note from **Allan S. Hoffman, X**, who is currently an associate professor of chemical engineering at M.I.T. After obtaining both his M.S. and Ph.D. from Tech, Allan spent a year in Paris on a Fulbright, post-doctoral grant for research in radiation polymerization—as well as French wines and politics! Before returning to the "ivory tower" Allan spent three years at California Research Corporation and one year in Boston at Amicon Corporation. He is married to the former Susan Freeman of Cleveland, and they have two children and a home in Lexington, Mass. **Whitman Richards, IX**, published a major article in the *Journal of the Optical Society of America* reflecting his work towards a Ph.D. in psychology at Tech. Prior to hitting the books again Whit was vice-president of A. S. Richards Company, manufacturers of thermocouples. Our yearly report on the **Sidney W. Hess, X**, family indicates that all is going well. Sid has left Atlas Powder Company to become an associate professor of operations research in the Wharton School of Finance at the University of Pennsylvania, where he divides his time between teaching research

and consulting projects. . . . **Jesse D. Erickson, XV**, has been named vice-president and general manager for Kaiser Aluminum of Canada, Scarborough, Ontario. Prior to his new assignment he was marketing manager in Canada and spent time in various assignments for Kaiser Aluminum on the West Coast. Jesse is living in Toronto with his wife and three children. . . . **Richard Chambers, XVII**, reports that he is beginning plans for our 15th Reunion. Progress in this direction will be reported in later issues, and we want to ask that all class members who have ideas for this event or would like to participate get in touch with your Secretary. All help will be very much appreciated.—**Norman R. Gardner**, Secretary, 100 Memorial Drive, Cambridge, Mass.

'54

Francis W. A'Hearn is busy serving many areas of the community. Besides successfully acting as Special Gifts Class Chairman of the Boston area for the '67 Alumni Fund, Frank is president of Mitre Employees Credit Union, sector captain of the Concord Community Chest, and a member of the American Society of Civil Engineers. . . . **David Leslie** has joined the staff of McKee-Berger-Mansueto, Inc., a firm of construction management consultants in Manhattan, where he will serve as executive assistant to Gerald McKee, Jr., one of the principals of MBM. Dave, a reserve officer in the Civil Engineers Corps of the U.S. Navy, formerly held the position of chief draftsman at the offices of Edward Durell Stone. . . . Captain **William Mayhew** has completed the U.S. Air Force weapons employment planning course at Maxwell A.F.B., Ala. The course provides officers and DOD employees with the fundamentals of weapon systems, analysis techniques and targeting methods needed to plan the use of air weapons systems. Captain Mayhew is a member of the Air Weather Service, serving as a liaison officer at the Navy Yard Annex in Washington. . . . In the author department, **Paul Gray** co-authored "Static V-I Relationships in Transistors at High Injection Levels" in the October *IEEE Transactions on Electron Devices*. . . . Dr. Gray is a professor in M.I.T.'s Electrical Engineering Department. . . . **J. Katzenelson**, who is also with that department, co-authored "An Iterative Method for Solution of Networks of Nonlinear Monotone Resistors" in September's *IEEE Transactions on Circuit Theory*. . . . Both **John Bremer** and **Z. J. J. Stekly** have contributed to the *IEEE Transaction on Magnetics*. John is presently engaged in development of new computer systems at General Electric's Phoenix Computer Department. Dr. Stekly is now director of the superconductivity and cryogenics operation at AVCO's Everett Research Laboratory, and recently participated directly in the development of practical superconducting coils. Before joining AVCO he was one of the founders of Dynatech, Inc., in Cambridge.

Thomas P. Murphy has been appointed general manager of Polypenco Canada Ltd., a recently established subsidiary of the Polymer Corporation in Acton, Ontario, Canada. The new company will produce nylon shapes and hose products for the Canadian market. Tom was previously director of development at Fiberfil, Inc. . . . **Dean Jacoby** frequently picks up and passes on to me news items in his role at M.I.T. The following are from Dean: "**Tom Bastis** dropped in to see me at M.I.T. during a business trip. He is currently the manager of product and process evaluation for Kaiser Aluminum, which means he is involved with finding new profit opportunities for the company. Tom has been with Kaiser ever since graduation and lives in Oakland, Calif. Children are Jonathan, Mark, David." Tom could provide a little information about **Jim Klapmeier's** activities which have been many and varied over the last several years. He is president and founder of Boatel Corporation, which is reported to be the largest houseboat manufacturer in the United States. Located in Minnesota, which is Jim's home, he has been branching out into several other associated manufacturing enterprises. **Jay Fues** would probably consider this to be out of date (but perhaps that will give him reason for providing us with more up-to-date information), but Tom said Jay is with Texas Instruments, Inc., and at one time had been their plant manager in England. According to Debby and **Roy Riedinger's** Christmas letter, they had a pleasant if uneventful year which did include, however, combined business/vacation trips to California and Puerto Rico. Roy is head of the commercial development department for Procter and Gamble's Industrial Chemical Division in Cincinnati.—**E. David Howes, Jr.**, Acting Secretary, Box 66, Carlisle, Mass. 01741

'55

Peter Toohy sent us such a nice note at Christmas time that we are quoting verbatim. "The Toohys are moving again with Shell. After five years of staff work in the New York area, three years selling thermo-plastics in Cleveland and a year and a half supervising five salesmen in Chicago, I have been appointed plant superintendent at Shell's polypropylene plant in Woodbury, N.J. Obviously, part of this must be related to my affinity for chemical engineering courses!" Pete goes on to say that he and Jane have bought a home in Cherry Hill, N.J. Let's all wish that they and the three girls are well-settled by now in both the house and the job. . . . **Edie and Bob Greene** are now in the Boston area. He is administrative assistant to the dean of engineering and is currently connected with the M.I.T. program at the Birla Institute of Technology in India. Bob recently returned from a month-long trip to India which was a real "eye-opener." . . . It seems like there is a preponderance of daughters this month, especially when we notice that Polly and **Paul Attridge** have announced the birth of Joanne on the 27th of December,

Susan and **Dennis Shapiro** introduced Alison Ivy to the world on November 18, and Georgia and **Jim Eacker** announced Suzanne Bailey on March 12, 1966. . . . We received a warm letter from Sylvia and **Martin Shooman** who are now living in Glen Cove, Long Island. Martin is currently finishing a book on reliability which McGraw-Hill will publish around the end of the year. They have a two-year-old, Andy, and are "hoping to introduce him to his new sister this spring." [This may not be too difficult since daughters seem to be in vogue this year—but please let us know, Marty, either way.] . . . **Roy Salzman** was recently elected vice-president, technical operations, of Adams Associates, Inc., of Bedford, Mass. Roy and Doris have closed their little shop known as ETC in Carlisle after a final "going-out-of-business" sale. They are currently building up enthusiasm toward building a new house in Carlisle using old wooden logs (beams) that were gotten from last summer's barn wrecking project. [Not only was the barn wrecked, but it seems to us that one R. Salzman was hobbling around on crutches for awhile, too.] Nothing like bringing up your children in a log cabin. Who knows, they might grow up to be president.—Co-secretaries: **Mrs. J. H. Vernerde** (Dell Lanier), 16 South Trail, Wilmington, Del., 19803; **L. Dennis Shapiro**, Aerospace Research, Inc., 130 Lincoln Street, Boston, Mass. 02135

'56

The class of '56 pulled its share of the load in the fall campaign for special gifts to the Alumni Fund. In the New York City area **Walter Frey** was chairman of the class effort, assisted by **George Brattin**. As of this writing they have reached 67% of the goal, with a few "possibles" still outstanding. In Boston **Sven Vaule** found a receptive audience among classmates who contributed more than \$900 to exceed their goal by 16%! Incidentally, Sven has accepted the post of Class Representative on the Alumni Council, replacing **Warren Briggs** who has resigned after several years of service. The Council is the national policy-setting body of the Alumni Association, so if you want your voice heard, Sven is the man to see. . . . Moving to the opposite coast, word comes that **Fred Culick** is now adding practical experience to his aero training by learning to fly. Pasadena is a long way from Boston even when you cruise at 180, he reports. . . . In Los Altos the **Charles Krugers** report that their 7-month-old daughter is keeping them busy. Charles, who teaches at Stanford, has been the collaborator with **Walter Vincenti** of a book named *Physical Gas Dynamics*, which has had a gratifying reception since its publication by Wiley a year ago. . . . **Walt Frey** writes that he, **Ed Baker**, and **George Brattin** had lunch together on December 7 at the Chemists Club in New York to discuss the possibility of conducting class luncheons at regular intervals. Another luncheon meeting took place on February 23, and if you are interested,

there will be more. . . . **Jim Allen** writes that he is a structural engineer with Stone & Webster working on power stations and paper mills. Jim is a registered professional engineer in California, Massachusetts and New York. Recently he has been on projects in Newport, Oregon and Woodland, Maine, and plans to go to London for a conference on prestressed concrete. Jim is married to the former Virginia Kearney, the daughter of a Tech grad, and they have two children, James IV and Karen. . . . **Bob Mansperger** again sent us a copy of his family Christmas letter. He is still busy designing controls for machine tools at Warner & Swasey near Cleveland. Bob and Pat's two sons are



H. Eric Theis, '55,
General Order
Manager, Machining
Division,
Jos. T. Ryerson
& Son, Inc.

growing up, and the family is quite active in church work and other community activities, including chairmanship of Cleveland Heights for the Alumni Fund. **Ed Najjar** is manager of research and development of Hampshire Chemical, now a division of W. R. Grace. Ed was married to Gail Aboshar in June 1965. . . . **Ed Pease** did his graduate work at Columbia and worked for several years at Merrill Lynch. He is now an investment officer at the Chase Manhattan Bank. Ed leads a very active outside life as treasurer of the Theological School of St. Lawrence U. and is a member of the Continental Board of Trustees of the Unitarian Universalist Church. During 1965-1966 Ed spent three months traveling around the world visiting many interesting places in Europe and Asia. . . . **Frank Spada** is director of product design of GPS Instruments and is attending management courses at Northeastern University. . . . **Valerie and John Stelling** moved back to the Boston area last June. John is a vice-president of industrial engineering, Thompson and Lichtner Company, a consulting firm. The Stellings have two daughters. . . . **Capt. Bradlee Terry**, USAF, writes that he is a fighter pilot and wing weapons officer at Homestead Air Force Base, Fla. Brad is a combat rated pilot and expects to soon have duty in Southeast Asia. . . . **Donald Tsiang** is now a self-employed consulting engineer in the Boston area after earning his masters degree at Northeastern's night school. Don is married to the former Claire Yip, and they have three children, Tina, Ted and Todd. Last Christmas also brought a brief note from Pat, Penny and **Phil Bryden** in Waterloo, Ontario. Phil is still busy teaching at the University and publishing papers on psychology.—Co-Secretaries: **Bruce B. Bredehoft**, 16 Millbrook Road, Westwood, Mass. 02090; **T. Guy Spencer, Jr.**, M.I.T., Room E19-439, Cambridge, Mass. 02139

'57 CLASS REUNION

June 9, 10, and 11

A recent news release from the Department of Housing and Urban Development brought the following information on the activities of **Ralph Warburton**: "Secretary Robert C. Weaver, of the U.S. Department of Housing and Urban Development, today announced the appointment of Ralph J. Warburton of Evanston, Ill., as consultant, to work closely with George T. Rockrise, Adviser to the Secretary for Design. Mr. Warburton will be concerned with matters relating to program policy, review, evaluation, operations, and liaison with professional, academic, development and research organizations. He is an associate and chief of planning with Skidmore, Owings & Merrill, architects-planners-engineers, of Chicago. Among his major responsibilities has been the Chicago Central Area Lakefront Development Plan, completed this year. Prior to joining Skidmore, Owings & Merrill in 1960, he was associated with design firms in Kansas City, Mo., Boston, and New York City. He received a bachelor in architecture degree and the Skidmore, Owings and Merrill Traveling Fellowship from M.I.T. Mr. Warburton received his master of architecture and master of city planning degrees, and the William E. Parsons Medal in urban design from Yale University. A licensed architect in New York, Illinois and Colorado, Mr. Warburton holds memberships in the American Institute of Architects, American Institute of Planners, and other professional societies. He is a member of the Metropolitan Housing and Planning Council of Chicago, and the Executive Committee of the Yale Arts Association. In addition to several articles contributed to professional journals, he is associate author of the book, *Man-Made America; Chaos or Control?*, published in 1963; and has been a speaker at conferences and meetings of civic and professional groups."

A brief note from **Alex Bernhard** advised me that he has returned from the West Coast and is now associated with the Boston law firm of Bingham, Dana, and Gould. . . . **Frank Murphy** has been named manager of systems research in process research for the technical staffs division of the Corning Glass works in Corning, N.Y. Frank joined Corning in 1962. After leaving M.I.T. he obtained a masters degree from Rensselaer Polytechnic Institute. . . . **Ed Roberts** recently received an award from the American Management Association for "contributions to aerospace marketing." . . . A card bearing a little pink ribbon brings us the news that my predecessor in this office, **Alan May**, and his wife are proud parents of one Alexander Nicole as of November. . . . The following information is submitted by **John A. Currie**, M.I.T., 77 Mass. Ave., Cambridge, Mass.: "Our 10th Reunion is just a little over two months away, and that means final registration forms should be sent in as soon as possible. If for some reason you haven't received yours by the end of April, write **Mal Jones** at M.I.T., Room

53-383, or call him at 617-864-6900, Extension 6601. Reservations can only be guaranteed if received before the cut-off date; after that we'll be able to place a limited few, but not many. If you have a wife, tell her to look for the May issue of the Review as Renata Cathou has promised to add some "clothing hints" in the class notes. As near as I can tell—and my data is admittedly sketchy—the class of '51 holds the all-time record (305) for a turnout at a 10th reunion. As I write this, almost four months to the day before the reunion and six weeks before you receive this issue, we already have over 200 signed up for Jug End. Perhaps we'll set a new record. More important than records, however, is the chance to renew old friendships and make new ones. See you in June." . . . That's all for now. I am running very low on news and would appreciate lengthy letters. Next month I'll have more news on Mal Jones and the reunion plans. Mal and his wife Jill will be visiting us in London before returning to the States from a business trip to Norway.—**Frederick L. Morefield**, Secretary, 18 Whaddon House, William Mews, London SW1, England

'58

While glancing through the January 1967 issue of *Fortune* magazine I noted with interest the article on the M.I.T. campus architecture. But it was when I got to the article on another generation of whiz-kids at Ford that I did a real double-take. There on page 107 were **Charles Talbot** and **Ken Whipple** pictured among a group of computer systems people. The article is very good, and you may want to look at this issue. . . . A letter arrived from **Bernie Schneiderman** reporting that he is "now finishing my 7th year with United Aircraft Research Laboratories in East Hartford, Conn., where I am working in the area of quantum chemistry. Also am finishing up a Ph.D. effort in physics at

William Reilly, '58, assistant professor of physics and chemistry (right), is promoted to lieutenant colonel at West Point December 20. With him at the promotion ceremony is Colonel Edward Saunders, Deputy Head of physics and chemistry.

PHOTO: U.S. ARMY PHOTOGRAPH



PHOTO: BURNS BROS.

Harold M. Laeger, '59, Associate Promotion Manager, *True Magazine*.



the University of Connecticut which has been in process for a number of years on a part-time basis. On this past Labor Day my wife gave birth to a bouncing baby boy. Also now have a daughter three years old. I saw **Tony Salotto**, Course X, last January. He is married and has a two-year-old son and a baby daughter. Until recently he was teaching at the Dutchess Community College in Poughkeepsie, N.Y. Believe, however, that he is now working on a Ph.D. in chemistry in New York City." . . . **Richard Taylor** has become co-publisher and partner with his father, Richard G. Taylor, in the ownership and operation of the *Kennett News and Advertiser*, Kennett Square, Pa. For the past six years he has been employed as a senior design engineer with the Hercules Powder Company in Wilmington, Del. He is a grandson of the late Ralph T. Wolfrom, publisher of the *Shippensburg (Pa.) News-Chronicle*, and we commend him for carrying on a fine family tradition and background in the publishing field. . . . **Jorge Alfert** writes that he is a senior technical associate in the Overseas Chemical Division of W. R. Grace & Company. He and his wife, Mayra, are living in New York City. . . . **Richard Thoft** has been appointed as a teaching fellow in ophthalmology at Harvard Medical School. He received his M.D. degree from Harvard in 1962 and is associated with the Massachusetts Eye and Ear Infirmary. . . . **Thomas Blood** is now a New York architect working abroad—with our Canadian friends. During the past four years he has been in Montreal as designing architect and associate in charge of two major theme buildings for Montreal's Expo '67 this coming summer—**Michael E. Brose**, Secretary, 1171 North Street, Walpole, Mass.; **Antonia D. Schuman**, Western Associate, 22400 Napa Street, Canoga Park, Calif.

'59

My apologies for the absence of notes in the past few months. I've been rather busy trying to finish a thesis, and it has been difficult to write about anything else. That situation has made it quite easy for me to justify pushing aside press clippings temporarily; however, when personal notes start to collect in my files, "something's got to give" and the typing starts. **Dave Cahlander** is now working for Control Data in Minnesota after receiving his Ph.D. in E.E. from the Institute in 1964. He and his wife Marjorie have two children, Diana 7 and Loren 4. Dave presented a paper at a NATO conference in Frascati, Italy, last fall on "The Bionic

Models of the Animal Sonar System"; he and Marjorie took advantage of the opportunity to tour Europe for four weeks. Marjorie (who handles the letter-writing) also mentions that **Lynn Jacobson** is married to the former Cindy Ahlers, has three daughters, and is working for the M.I.T. Lincoln Laboratory on the island of Kwajelin. He received an E.E. degree from M.I.T. in 1965. She adds that **Hartley Hoskins** is working at the University of Ghana. . . . Well-traveled classmate **Phil Beach** writes that he spent two years in the government of Sierra Leone in West Africa, and returned to M.I.T. for six months. "During the latter I was asked to expound upon 'Pan-Africanism' at a church seminar where my then wife-to-be, Susan Williams (Wellesley 1964), gazed tauntingly up from the audience. We've been in Venezuela for over two years. When my challenging new job with the International Basic Economy Corporation allows time, we head for the coast and sailing the blue Caribbean on our new 33 foot Vanguard auxiliary sloop, *Borrasca*. Best to '59." Best to you, too, Phil. Um, you don't by any chance need a crew do you? . . . A letter from **John Rainey's** mother tells us that John and his wife Lenore are both doing graduate work at R.P.I. John hopes to receive his Ph.D. in math this June, and plans to go into teaching thereafter. . . . Barbara and **Steve Parkoff** announced the birth of a daughter, Susan Beth, at the end of last year. . . . A month later came the announcement of the birth of daughter, Stacey, to Cindy and **Don Spiller** (with a well-deserved exclamation mark after the 9 lb. 10 oz.). . . . From direct contact rather than letter comes word of **Jack Kossler**. He and Peggy moved in across the street from your Secretary, and it was more or less by accident that we discovered that we were classmates. Jack has a Ph.D. in physics from Princeton, and is presently an assistant professor at M.I.T. They have two sons, Neil 4 and Bill 1½. . . . Thank you very much for writing, folks. It's much appreciated. With a little bit of luck I should be finished with my thesis by this time next month and will be able to get to the pile of press clippings.—**Glenn Zeiders**, Secretary, 3 Rose Ave., Watertown, Mass. 02172

'60

Robert Kiley writes the following: "After one has married, what is one's first most important duty? Notify Class Secretary, of course. Joyce Matteson and I were married in Manhattan on October 15, 1966, and after a honeymoon in California and Mexico we live in Connecticut where Joyce is a chemist for Standard Brands and I am assistant to the president of Aerosol Techniques, Inc. We are the largest contract fillers of aerosols in the world and have a plant in Boston, two in Connecticut and one each in California and Illinois. I was just issued my first patent (#3285702) on heat transfer in rotating machinery. Since leaving the Institute I spent two years in Army ordnance and two years in Harvard Business

for an M.B.A. I hear from **Fouad Malouf** who is in Beirut in construction. I just heard from **Peter Mehlhorn** who is a naval lieutenant stationed at Guantanamo Bay, Cuba." . . . And another wedding announcement—**Ralph Cuomo** was married to Regina Shaputnic on February 4 in Cambridge. . . . More news from Cambridge, this time from "up the river"—**Bob Rothstein** has been appointed assistant professor of Slavic languages and literatures at Harvard; Bob has been a teaching fellow there since 1962. . . . **Dick Hornby** has been appointed an assistant professor of English at Bowdoin College, Brunswick, Maine; Dick is also dramatics director there. . . . **Brenton Groves** received a Ph.D. from Ohio State University in December. . . . If any of you are in legal trouble in Detroit, **Lloyd Fell** is an attorney there with the firm of Bodman, Longley, Bogle, Armstrong & Dahling. . . . Jim, '58, and **Beryl Denker** are living in Scituate. They have two children, Karen and Jeffrey; Jeffrey was born October 8, 1966. . . . **June Bernzweig Appel** has just moved from Louisiana to Merritt Island, Fla. (near Cape Kennedy); she and Len have three children, Beth, David and Peter. . . . **Tom Farquhar** reports that **Ben Harris** and his wife were in town a few weeks ago; Ben is in the army and will be headed for Vietnam in May. . . . Any news? Send it along to—**Linda G. Sprague**, 345 Brookline Street, Cambridge, Mass. 02139

'62 CLASS REUNION June 9, 10, and 11

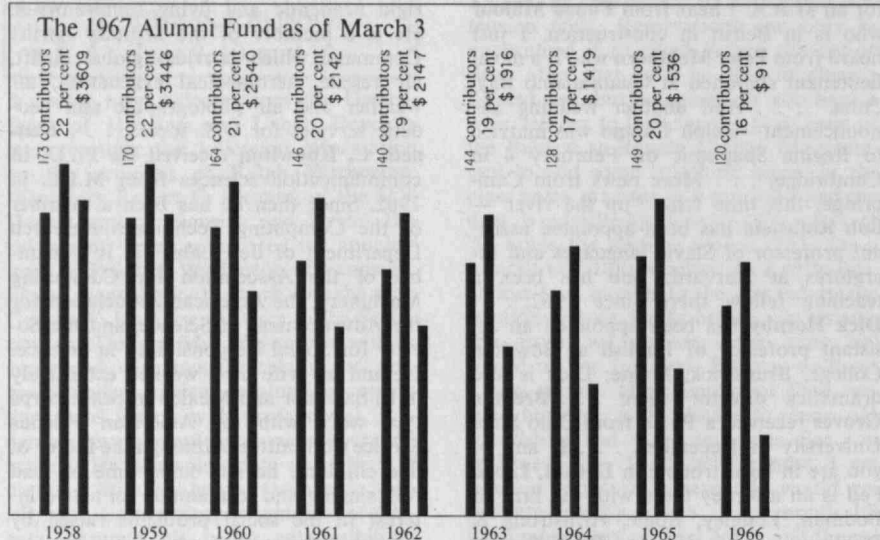
First lieutenant **Chester H. (Chet) Riley** has been certified as a C-135 Strato Lifter aircraft commander at McGuire A.F.B., N.J. Lt. Riley was upgraded after passing

A superconducting magnet capable of producing a field of 100,000 gauss is prepared for immersion into liquid helium by Dr. Mark G. Benz, '59, a metallurgist at the General Electric Research and Development Center. Dr. Benz developed the strong and highly flexible niobium-tin tape with which the magnet is wound.



rigid academic and flying requirements. He is a member of the Military Airlift Command which provides global airlift, air rescue, aeromedical evacuation, air weather and air photographic and geodetic services for U.S. forces. . . . **Kenneth C. Knowlton** received his Ph.D. in communication sciences from M.I.T. in 1962. Since then he has been a member of the Computing Techniques Research Department of Bell Labs. He is a member of the Association for Computing Machinery, the American Association for the Advancement of Science, and the Society for Social Responsibility in Science. He and his wife have worked extensively in El Salvador and Mexico in peace-corps type work with the American Friends Service Committee. Although the father of five children, he still finds time to lead folk singing and to maintain an active interest in the social problems raised by modern computers. I received a copy of an article he wrote entitled, "A Computer Technique for the Production of Animated Movies," a subject in which he has apparently done considerable work. . . . Major **Forrest T. Gay, III**, who received his M.S. in civil engineering and nuclear engineering from M.I.T., recently returned from Vietnam and is a student at Naval War College in Newport, R.I. He was engaged to Miss Mary Carolyn Branch of Tallahassee, Fla. . . .

Carl A. Bauer, Jr., is now residing in Holland with his wife and three children. He is personnel manager for Dow International's Rotterdam location with primary responsibility to recruit and organize a central European Engineering Department for Dow. . . . **Alan H. Luther**, whose field is political science and who has been at the U.S. Naval Ordnance Lab, will be on a National Science Foundation fellowship at the Technical Institute at Munich, Germany. He received a NATO postdoctoral fellowship in science. Only 45 persons were selected, and they will receive a stipend of \$6,500 for 12 months and \$4,875 for 9 months. . . . **William H. Geoghegan** is at the Department of Anthropology at Stanford University. . . . **Michael Hall** is in the math department at U.C.L.A. and **David Knee** is in the same department at Hofstra University in Hempstead, N.Y. **Robert Matia** is at Squire, Sanders & Dempsey in Cleveland, Ohio. . . . I have accepted a new position as general manager of Nellum Investment Company in Seattle, Wash. Nellum is a newly formed land development subsidiary of S. S. Mullen, Inc., a heavy construction company based in Seattle. Nellum will concentrate on industrial and commercial development in the Seattle area. My responsibility will be to build Nellum into an on-going and profitable real estate conversion company. S. S. Mullen, Inc., had a volume of \$25 million last year and operations in five states. By the time this article is printed, Linda, Pam and I hope to be in a new house in the Seattle area. The reunion is approaching rapidly (June 10 and 11), and I look forward to seeing you all at the White Cliffs. Spread the word.—**Jerry Katell**, Secretary, Oceanic Properties, Inc., 1 Bush St., San Francisco, Calif. 94104



'63

The only news received this month was from **Don Dreisbach** in Iran. He writes, "After graduation I did two years of graduate work in the Department of Philosophy at Northwestern University. Then I went into the Peace Corps where I am now finishing my second year of teaching English at the University of Tabriz in Iran. I'll return to the States this summer and to graduate study at Northwestern. The only classmate I hear from is **Steve Fisher** who is finishing his doctorate in math at Wisconsin." Send any news to—**L. Robert Johnson**, Secretary, Kidder Peabody, 20 Exchange Place, New York, N.Y. 10005

'64

My wife Betsy and I had a pleasant dinner at an Italian restaurant in Boston in January with **Ron Cordover** and his wife Barbara. As they slowly prepared our meal (noodle by noodle), we found an excellent opportunity for conversing about both the past and the future. Ron is in the final stretch of his Ph.D. program in electrical engineering at M.I.T. He plans to finish this June, at which time he will enter the world of business. . . . **Dave Dunford** and his wife set sail from New York in January for a voyage to Quito, Ecuador, where Dave will assume his post as vice-consul, third secretary, at the U.S. Embassy. Dave is a member of the foreign service and will be in Ecuador for two years. . . . **J. R. Gwozdz**, who received his M.S. at M.I.T., was a co-author of an article in the September 1966 issue of the *A.I.Chem.E. Journal* entitled "Turbulent Dispersion in a Pipe Flow." . . . **Karl Loos**, who received his Ph.D. in chemistry from M.I.T., has joined the research staff of Shell Development Company in Emeryville, Calif. . . . **Dino Lorenzini**, who received his M.S. in aero at M.I.T., has been promoted to captain in the Air Force. He is a guidance and control engineer at Holloman A.F.B., N. Mex. . . . **Jerry Luebbers**, our Class

Vice-president, is working for Donaldson, Lufkin & Jenrette, Inc., a firm of investment bankers in New York City. . . . **Anthony Nunes** was married to Miss Meredith Holden of Wellesley Hills in the M.I.T. Chapel in early January. They are now living in Cambridge. . . . **Ron Randall** is a second lieutenant in the Army Adjutant General Corp at Fort Monroe, Va., where he is doing computer work. . . . That's all the news that has appeared this month. Do your part to increase the flow.—**Ron Gilman**, Secretary, 202A Holden Green, Cambridge, Mass. 02138

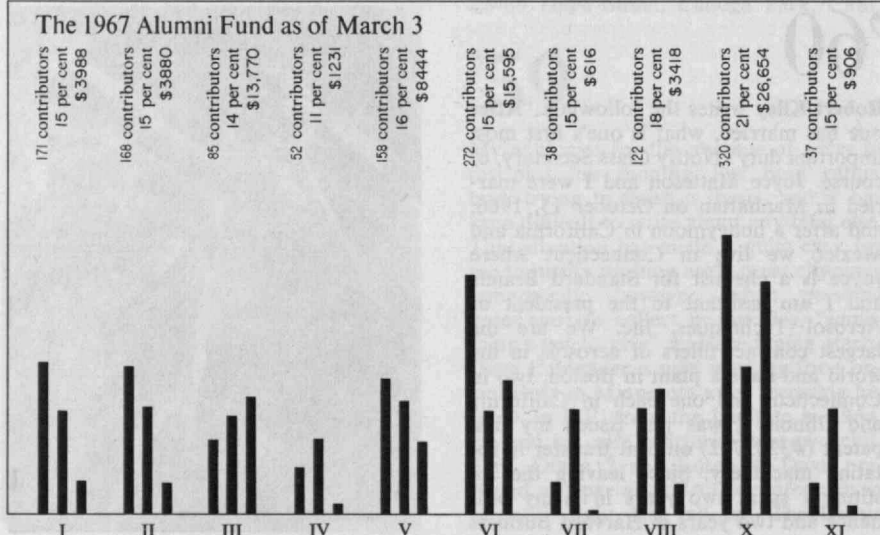
Graduate Students

V

The following is taken from "A History of the Department of Chemistry and Physics M.I.T. 1865-1933" and may be of interest to alumni. The section on chemistry was written by Professor Tenney L. Davis, and the book was published by the Technology Press and distributed at the dedication exercises of the Eastman

Laboratorie (Building 6). "In 1903 the Research Laboratory of Physical Chemistry was organized with Arthur Amos Noyes as director, and in 1907 the degree of Doctor of Philosophy was awarded to three of its students, Raymond Haskell, '03, Robert B. Sosman, '04, and Morris A. Stewart, '07. This was the first time that the doctor's degree was awarded by the Massachusetts Institute of Technology." . . . In September 1966, the Institute awarded 16 Ph.D. degrees in chemistry: four in analytical, two in inorganic, one in nuclear, seven in organic, and two in physical chemistry. Five accepted post-doctoral appointments, two in England, one in Germany and two in the United States; two accepted assistant professorships in this country; six were employed by industry; two commissioned first lieutenants in the Army to fulfil their obligations under their undergraduate R.O.T.C. affiliation; and one returned to his native land, Japan. All sixteen came to the graduate school in chemistry with bachelor degrees from other colleges and institutions.

In February 1967 the Institute awarded 18 Ph.D. degrees in chemistry: fourteen in organic, three in physical and one in inorganic chemistry. Congratulations to the following from the entire staff in chemistry and from all those recent graduates who knew them well. The recipients were—organic chemistry: **William R. Bergmark**, B.A. St. Olaf College '62, **DeLanson R. Crist**, B.A. Swarthmore '62, **Mrs. Hadwig Dertouzos**, B.S. Univ. of Tuebingen '62, **Miss Anna Fang**, B.A. Cornell '62, **Michael W. Fordice**, B.A. Macalester College '62, **Samuel E. Kirkorian**, Sc.B. Brown '51, **Thomas J. Lynch**, B.S. Boston College '62, **Gary F. Mitchell**, B.S. Cal. Inst. of Tech. '62, **Mrs. Joanne Mitchell**, B.S. Rochester '62, **James A. Raleigh**, M.Sc. Univ. of British Columbia '62, **George M. Rubottom**, B.A. Middlebury '62, **Harvey P. Stein**, B.S. Queens College '61, **David W. Thomas**, B.A. Swarthmore '62, **John T. Viola**, M.S. Penn State '64; physical chemistry: **Henry F. Gibbard**, B.S. Oklahoma Univ. '62, **Wallace C. Pringle, Jr.**, A.B. Middlebury '63, **George J. Thomas**, B.S. Boston College '63; inorganic chemistry: **John W. Faller**, M.S.



Univ. of Louisville '63. . . . The Institute also awarded master of science degrees to: **Thomas M. Bare**, B.S. Penn State '64, **William M. Bunting**, B.A. Coll. of Wooster '64, **Melvin L. Loeb**, B.S. City College N.Y. '64, **Thomas M. Ozretich**, B.S. Seattle Univ. '64, **Mary G. Panek**, B.S. Univ. of Penn. '65, **Eugene J. Volker**, B.S. Univ. of Maryland '64, **William Felder**, A.B. Univ. of Penn '64. All of these will continue at M.I.T. for the doctorate except Mary Panek who has become a housewife and Eugene Volker who is enrolled as a doctoral candidate at the University of Delaware. Of the doctoral candidates seven accepted postdoctoral appointments, two in England and five in the United States, four accepted academic appointments in this country, five are employed by industry, one commissioned as a captain in the Air Force and one, Mrs. Dertouzos, is at home. The total of doctoral degrees in chemistry awarded as of this date is 1,021, total master's degrees, 281.—**L. F. Hamilton**, Correspondent, Room 4-258, M.I.T., Cambridge, Mass. 02139

XII

Dr. Louise Jordan, well-known petroleum geologist, died on November 22, 1966, after a long illness. She was graduated from high school in Port Henry, N.Y., in 1925 and received her Bachelor of Arts degree in geology and chemistry from Wellesley College in 1929. She earned her Master of Science degree in geology from M.I.T. in 1931 and her Ph.D. in 1939. For the past 36 years she had traveled widely as a professional geologist, and for the past 10 years had been employed by the Oklahoma Geological Survey.—**Robert R. Shrock**, M.I.T. 54-926, Cambridge, Mass. 02139

XIII-A

Robert C. Gooding, M.I.T. '46, Captain, U.S. Navy, visited the Institute in January to attend a seminar at the Operations

Research Center. Bob is currently technical director of the special projects office in the Navy Department. This office is responsible for the design, development, production and support of the Polaris and Poseidan weapons systems. Bob's son Robert is following the engineering trail as a junior at Georgia Tech. Joyce solved the problem of the lonely housewife by returning to work as secretary to the principal of Alexandria Junior High. . . . Captain **John Collins**, USN, M.I.T. '52, visited M.I.T. in early February. John is now director of military personnel in the Naval Ship Systems Command. In this position he is responsible for management of the military personnel under the control of this command. Since most of the graduates of Course XIII-A and the NROTC unit work for the Naval Ship Systems Command, John has a vital interest in these two programs at M.I.T. Since graduation from M.I.T., John has seen duty in the design division of BuShips, the Naval War College at Newport, R.I., and in the destroyer forces. . . . **Daniel Marangiello**, M.I.T. '56, visited the Institute to discuss ocean engineering matters. Dan left the Navy last December and is now working as an engineer for the Westinghouse Deep Submergence Systems Group in Baltimore, Md. After ten years of work associated with the engineering problems of submarines, it is not difficult to imagine Dan hard at work on deep diving vehicles. Dan is still a bachelor, living in Georgetown, D.C. His 21 foot auxiliary sloop lies in Chesapeake Bay waiting for visiting weekend sailors. . . . The New England section, Society of Naval Architects and Marine Engineers, held a symposium in January on "Computers in the Marine Industry." Commander **E. J. Otth**, USN, M.I.T. '55. Ed '61, presented a paper on "Management Information Systems for U.S. Naval Shipyards." Gerry is currently in charge of the Naval Ship Systems Command efforts in the use of computers in shipyard management. He came to this assignment after several busy years in submarine repair and construction at the San Francisco Bay Naval Shipyard at Vallejo, Calif. . . . Among those in the audience was Commander **E. J. Otth**, USN, M.I.T. '55. Ed



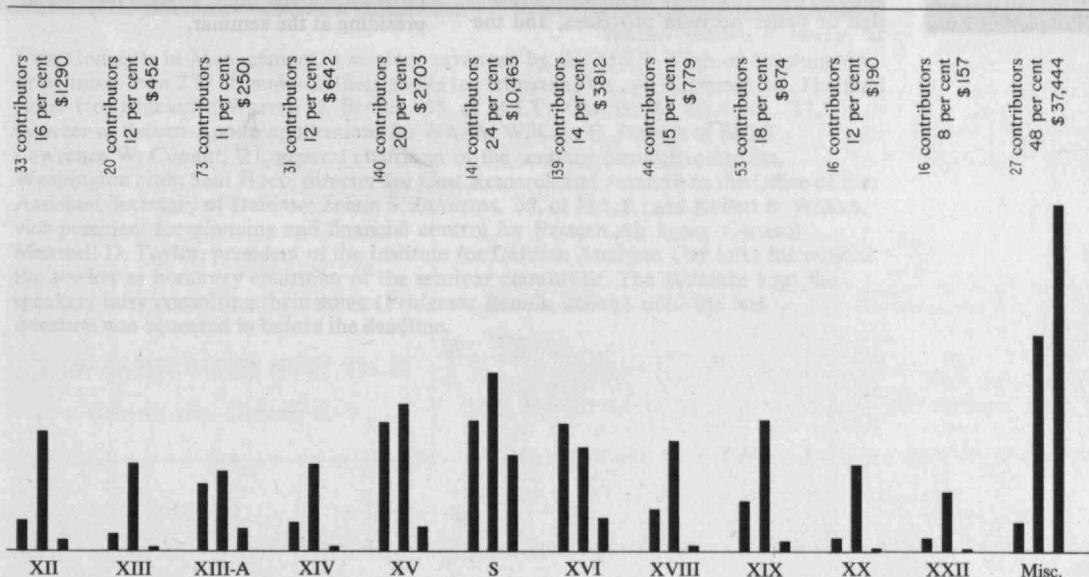
PHOTO: AURORA PHOTOGRAPHIC

Three members of the American Institute of Chemical Engineers were honored recently when they received the Institute's Founders Award at the 59th annual meeting of the A.I.Ch.E. in Detroit. Shown above receiving the awards are (left to right) **E. W. Thiele**, Department of Chemical Engineering, University of Notre Dame; **Manson Benedict**, V, S.M., Ph.D. '32, Head of Nuclear Engineering Department, M.I.T.; and **E. R. Weidlein**, retired, Pittsburgh, Pa. They were honored in recognition of outstanding contributions in the field of chemical engineering.

is currently on the staff of Commander Destroyer Force, U.S. Atlantic Fleet. Since graduation Ed has served in the Philadelphia Naval Shipyard and in the Bureau of Ships. In both locations he has continued his active interest in destroyers and surface ship missile systems.—Captain **Robert E. Stark**, Correspondent, M.I.T. 5-304, Cambridge, Mass. 02139

Sloan Fellows

John C. Davis, '56, executive assistant, finance, of the Atchison, Topeka and Santa Fe Railway system at Chicago since 1964, has been named vice-president, executive department. This was effective January 1. He entered Santa Fe service in 1941. . . . **James L. Powell**, '63, has moved from Bucyrus to Canton, Ohio, where he is administrative assistant of the Ohio Power Company. At Bucyrus he was manager.



Club News

M.I.T. Club of Washington Seminar: New Concepts of Management

Charles W. Mathews, '37, NASA director of Saturn-Apollo applications, summarized the meeting during the discussion period: "The important thing is the relationship of the human to the system."

The occasion was the M.I.T. Club of Washington seminar on New Concepts in Management, which brought three members of the Sloan School of Management faculty, three panelists, and several other speakers together on a snowy Saturday afternoon for an audience of more than 250 alumni and guests on February 18.

The Sloan School representatives were William F. Pounds, dean; Zenon S. Zannetos, '55, professor of management; and Warren G. Bennis, '55, professor of organizational psychology and management. Saul Hoch, director for cost research and analysis in the Office of the Assistant Secretary of Defense, and Robert B. Wilson, vice-president for planning and financial control, Operations Division, Eastern Air Lines, joined Mr. Mathews as panelists. And General Maxwell D. Taylor, president of the Institute for Defense Analyses, opened the four-hour symposium.

Dean Pounds' remarks served to summarize the development of quantitative methods and the new concepts arising from their application to management. Analytical techniques applied to decision-making are now commonplace in such management areas as inventory control, cost analysis, marketing and distribution. The new trend is the result of turning this process around: it is possible to study the decisions which management makes on any particular kind of question and with modern analytical procedures derive the set of values which were implied by the decisions, "to determine what managers do when they make decisions."

The result, said Dean Pounds, is that people "can now think of decision processes as explicitly as they earlier thought about work simplification and inventory control." And when decision processes are so explicitly described, Dean Pounds pointed out, "it is easy to imagine the design of better decision processes, and the

explosive developments in the field of information systems follow directly."

But what will be the effect on an organization of such analytically derived decision rules? No simple answer is now possible, Dean Pounds said, except in the short run: "The first-order effects appear to be positive; companies are undertaking to extend such applications, and they are productive." But will the organization whose decisions are made for it attract people who are able to make decisions?

Such people will be more indispensable in the future than in the past. The important man now, said Professor Bennis, is the "learning man, who can identify with the process of seeking new solutions and learning new facts." Such men are adaptable to new conditions, suspicious of authoritarian responses based on experience; they have a spirit of inquiry, tolerate ambiguity and complexity.

Most people like to participate, Professor Bennis added during the discussion session in answer to a question, and this kind of human commitment to a system can be achieved. But there are serious constraints to participation, too, which come from the situation, from the complexity of the task, from the history and orientation to authority of the system, from the role of the subordinate in sharing the system's goals.

During the discussion session, Dr. Hoch expressed concern felt by many in the room: new techniques are sometimes glibly applied to problems which they do not fit. To reassure him, Professor Zannetos pointed out that information systems can now be designed to sequentially check themselves and so discover whether or not the model on which they are working is in fact a useful one. And, said Dean Pounds, there are few situations which exactly fit any available form of analysis. "It is not the task of the man building a model to propose that he has found the truth; he cannot do it. His task is to be useful: to look at the problem as best he can."

The Washington club's seminar was arranged by Lawrence W. Conant, '21, as chairman, with John C. Schroeter, '30, and Breene M. Kerr, '51, as deputy chairmen. Mr. Conant and Gilbert H. Lewis, president of the club, shared the task of presiding at the seminar.





PHOTOS: WILLIAM G. OSMUN, '40

New Concepts in Management, a seminar arranged by the M.I.T. Club of Washington, drew more than 250 alumni and their guests to Arlington, Va., on February 18. The final panel (top) included Warren G. Bennis, '55, of M.I.T.; Charles W. Mathews, '37, director of Saturn-Apollo applications for NASA; William F. Pounds of M.I.T.; Lawrence W. Conant, '21, general chairman of the seminar committee for the Washington club; Saul Hoch, director for Cost Research and Analysis in the Office of the Assistant Secretary of Defense; Zenon S. Zannetos, '55, of M.I.T.; and Robert B. Wilson, vice-president for planning and financial control for Eastern Air Lines. General Maxwell D. Taylor, president of the Institute for Defense Analyses (far left) introduced the session as honorary chairman of the seminar committee. The audience kept the speakers busy consulting their notes (Professor Bennis, above) until the last question was squeezed in before the deadline.

MAKE YOUR RESERVATION NOW
Full details are on the way

Register Monday, March 19, 1967, 9:00 a.m. - 5:00 p.m.

Free Parking On Saturdays at 2 Arlington Center Plaza adjacent to the Student Center

Club News

Association of M.I.T. Alumnae: Role of M.I.T. Women Discussed

On February 13 the Association entertained some 70 women students, juniors, seniors and graduate students, at the M.I.T. Faculty Club for dinner. President Howard W. Johnson was the featured speaker. He discussed his philosophy of education and the role of women students at M.I.T. throughout the years. Other guests included Professor and Mrs. John W. Irvine, Professor and Mrs. Linwood Bryant and Dean Emily Wick, '51. The Association's annual award to a member of the Junior Class for outstanding achievement was awarded to Miss Karla Hurst of the class of 1968. A check for \$100 accompanied the citation.—Mrs. George E. Kimball, '36, Vice-president, 20 Everett Ave., Winchester, Mass.

M.I.T. Alumni Council: Technical Entrepreneurship

Members of the Alumni Council entertained more than 35 undergraduates, recipients of Alumni Fund National Scholarships, at their meeting on February 27. The group was introduced by James O. McDonough, '43, a member of the Alumni Fund Board, and Jack H. Frailey, '44, M.I.T. Director of Student Aid.

In other actions, the Council heard preliminary plans for the 1967 Alumni Seminar, to be held September 8 to 10 on the general topic of "Cities in Crisis;" and received an announcement of two European flights designated as the 1967 Alumni Association Group Flights leaving Boston June 14 and June 30 under the management of Technology Student Enterprises, Inc.

The evening's speaker, Edward B. Roberts, '57, Associate Professor of Management, reported research in the Sloan School of Management on technology transfer and technical entrepreneurship, focusing on the extension into the general economy of technical developments originating in four M.I.T. laboratories and four academic departments. The research group has now documented more than 160 new companies formed to exploit M.I.T. research results, and Dr. Roberts' group now seeks to discover the characteristics of these new companies and of their managements; and the qualities of the environment at M.I.T. and in the Greater Boston area which encourage such apparently unique activity.

M.I.T. Club of Boston: President Johnson in April

M.I.T. basketball coach Jack Barry talked to the Boston Club on February 9 about the trip his team took to Europe last summer. The boys compiled a 14-12 record against Iceland, Yugoslavia, Greece, and other countries. Jack had many amusing anecdotes to tell about the games, opposing teams, partisan referees, and espe-

cially the people of the various countries, most of whom displayed warm friendship towards our team. Jack showed many colored slides of the places visited.

At the Club's March 8 meeting, Owen B. Kiernan, Massachusetts Commissioner of Education, a member of the M.I.T. Corporation, described some present-day problems in education. Schools in Massachusetts, he said, are a \$750 million enterprise, but in terms of the needs "we are not beginning to scratch the surface." Our spending for education "shrinks into insignificance" when compared with other U.S. expenses, Dr. Kiernan said, and he cited a few of the costs of the war in Vietnam to support his conclusion. Other problems which he discussed included racial imbalance, student participation in administration, and local autonomy.

The M.I.T. Club of Boston is proud to announce that President and Mrs. Howard Johnson will be guests of the club at its annual dinner meeting at the M.I.T. Faculty Club on April 13. President Johnson will address the club after dinner. Alumni interested in attending this meeting may obtain ticket applications from—Eugene M. Darling, Jr., Club Secretary, Boyce Farm Road, Lincoln, Mass. 01773

**M.I.T. Alumni Center of New York:
Computers for Management Information**
Five evening sessions on Computers for Management Information have been scheduled by the M.I.T. Alumni Center of New York for its annual spring seminar. The dates and topics are:

March 21—A Management Information System: Design and Implementation.

April 4—Management Information for the Airline Industry.

April 18—Graphic Data Processing.

May 9—The Computer in Manufacturing Industries.

May 23—The Engineering Use of Computers.

The seminar will meet in two-hour sessions at 7 p.m. on each of the dates indicated at the Carnegie International Center, 345 East 46th Street. The presentations, by competent instructors, will emphasize practical, first-hand information on current developments. For further information write or call the M.I.T. Alumni Center of New York, 866 United Nations Plaza.

M.I.T. Club of Western New York: President Leaving; June Student Luncheon

Club President H. Paul Julien, Ph.D., V, '55, is joining the Jim Walter Research Corporation as manager of the Advanced Technology and Testing Division. He will be located at the corporation's new research center now being constructed in St. Petersburg, Fla. Paul has been director of research at Carborundum in Niagara Falls. The club will continue to operate smoothly because Paul has been a good president and has delegated authority extensively. Club Vice-president, Alan Storms, '58, is arranging for the annual meeting in May and the spring student

luncheon in June. Charles Diebold, 3d, '58, was general chairman for a visit to Buffalo by M.I.T. chairman, James Killian, '26. Jim Neal, '15, of Rockport is our club's candidate on the M.I.T. ballot for Alumni Association National Nominating Committee. Jim has recently retired and would have full time for the job and all his talent as president of Norton Laboratories.

Sitting here in Buffalo in the midst of February with two or three inches of snow accumulated in my back yard, we extend our sympathy to the M.I.T. Clubs of New York, Chicago, and other points north, south, east, and west, which have been forced to cancel meetings on account of deep snow. Respectfully submitted—Donald R. Ferguson, '57, Club Secretary, 333 Ellicott Street, Buffalo, N.Y. 14203

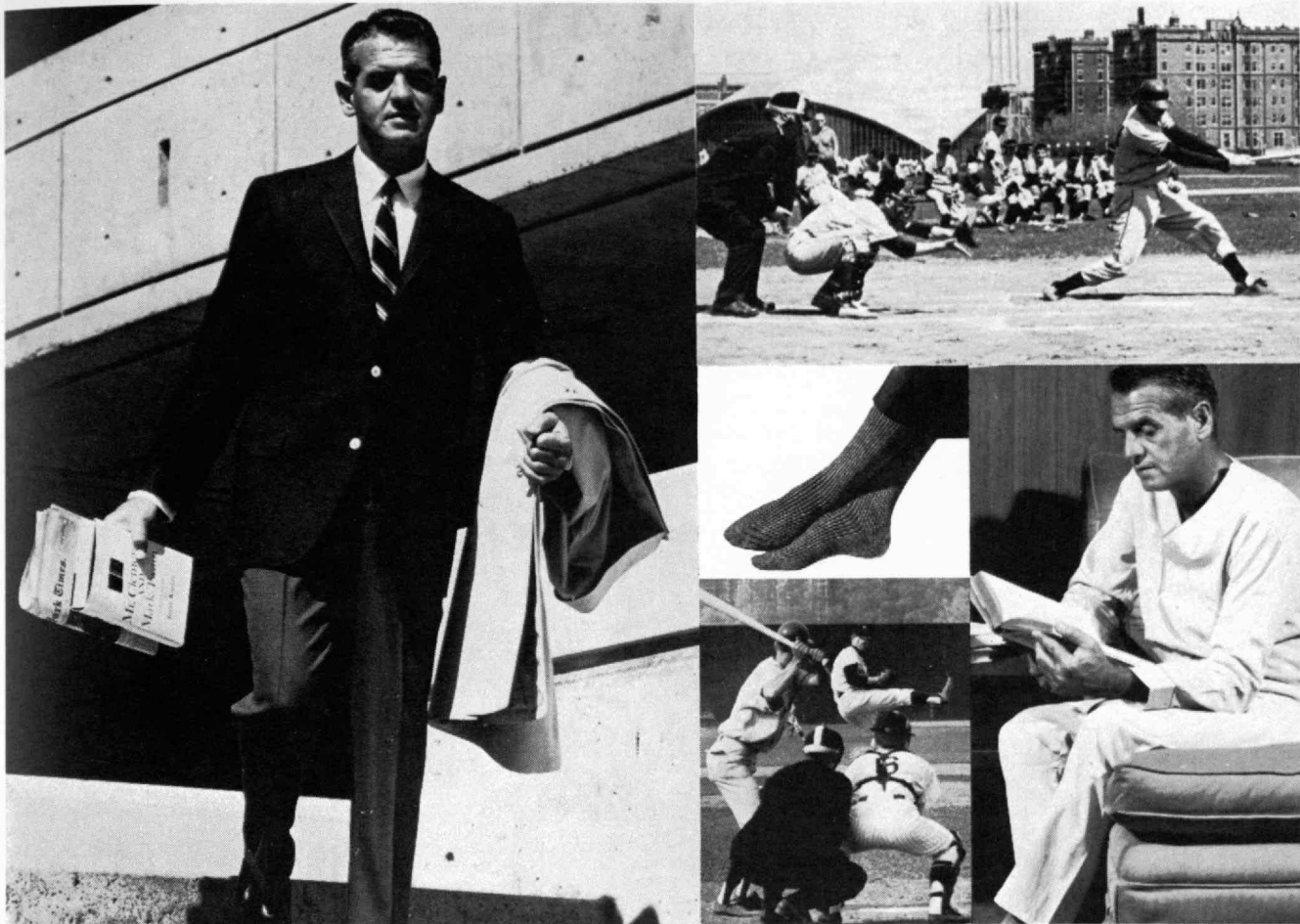
**M.I.T. Club of South Texas:
Sailing Enthusiasts Hear Yacht Designer**
"New Developments in Yacht Design" was the topic of Halsey C. Herreshoff, S. M. XIII '60, on Tuesday, March 28. He was the guest speaker at the M.I.T. Club of South Texas' dinner at the Nassau Bay Holiday Inn, Houston. Mr. Herreshoff, who heads yacht sail research in the Department of Naval Architecture and Marine Engineering at M.I.T., was not disappointing to many sailing enthusiasts who attended the cocktail hour and dinner.

PLAN AHEAD for your CLASS REUNION!!

Mark these dates down
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June 9 10 11
AND
Alumni Day June 12

- Renew old friendships
- Relax and enjoy a wonderful week-end
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MEN ON THE MOVE . . . INTENT ON WHERE THEY'RE GOING

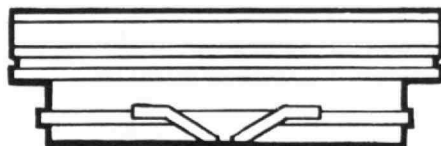
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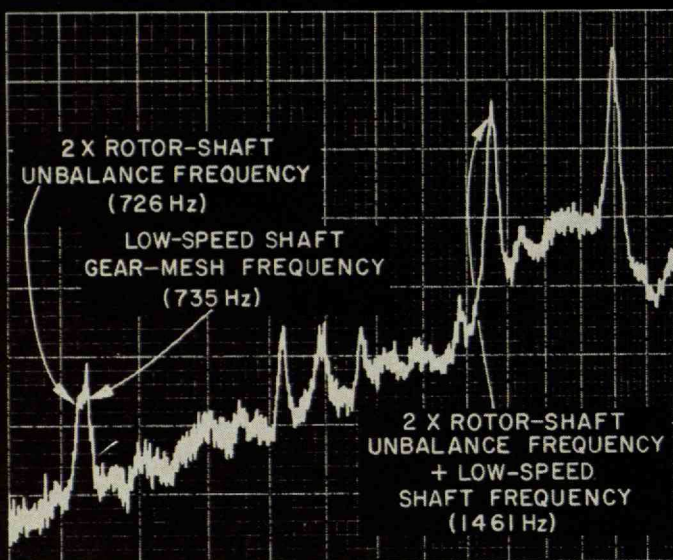


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Null Detectors
Oscillators
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Plugs & Jacks
Potentiometers
Power Supplies
Pulse Generators
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